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**SUSTAINABLE HOUSING DESIGN AND  
DEVELOPMENT IN RELATION TO THE CITY OF  
JIJEL, ALGERIA.**

**MIA MEHIBEL**

A thesis submitted to the University of Huddersfield in partial fulfilment of the requirements  
for the degree of Doctor of Philosophy

October 2018

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## **Abstract**

Sustainable architectural design is still in its early stages in many developing countries. There are many pressures that can reduce application of sustainable design; for instance over one billion people worldwide still lack adequate shelter and suffer from poverty. Algeria is an example of a country facing a pressing housing shortage which takes precedence over such features as energy efficient design. There is currently an inability of the government to effectively respond to housing needs in both qualitative and quantitative scales. The problem threatens cities with a large spread of informal settlements and slums around many Algerian cities.

The main aim of this research is to investigate the Algerian housing sector and the housing policy adopted by the government, and to examine potential for future more sustainable outcomes. The problems and obstacles facing the sector are addressed with a particular focus on the city of Jijel. This research also aims to assess the professionals' awareness of the sustainability issues and investigates the aspects of traditional and contemporary architecture in Algeria which are suitable for the planning of sustainable settlements.

The research methodology involved carrying out quantitative and qualitative analysis (mixed method) of the housing sector in Algeria using comparative analysis for different types of houses: collective apartments; traditional courtyard houses; and self-build houses. This involved descriptive, qualitative, and spatial analysis of case studies and the use of survey questionnaire. The survey questionnaire helped to assess the inhabitants' satisfaction with their houses and was initially used with residents of 30 collective apartments from three different estates in the city of Jijel. Later, residents of 10 selected self-build family houses were interviewed. Finally, the survey was carried out with residents of traditional courtyard houses in the city of Constantine.

This study found that despite being sustainable at the time of building, traditional courtyard houses can no longer be considered as an example of sustainable housing due to the degradation of the houses caused by age and poor maintenance. In addition, overcrowding and the occupation of a number of houses by non-relatives have caused a lack of comfort and privacy. The study also found that there is a wide neglect in all types of house of climatic design principles required to help achieve thermal comfort. Occupants are more concerned for spatial comfort and believe they can deal with thermal comfort using energy consuming appliances. However, the continual increase in fossil fuel use and energy costs in Algeria could make these houses either very expensive to run or even unusable in the future. In addition, the poor quality of the exterior environment and the lack of certain necessary amenities and services needed in daily life, have affected the satisfaction of residents. Most of the interviewed residents would prefer to participate in the design of their houses; a process that would enable them to improve use of space and thermal comfort.

It was concluded that many problems facing the housing sector in Algeria cannot be solved by either state-led projects or by self-build informal construction. The research highlighted that the most important issue is the serious imbalance between housing supply and demand and unless lessons from the failures of previous policies are learned and new effective measures enacted by the government, the housing policy in Algeria is likely to fail again. This would further compromise provision of adequate housing and potential for future urban sustainability.

Some suggestions are made for stakeholders and planners to aid in developing strategies to create new sustainable cities that can achieve both residents' satisfaction and reduce negative impact on the environment.

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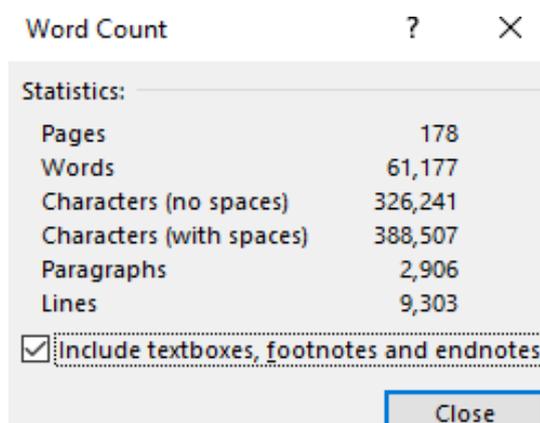
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Mia Mehibel

## **List of Abbreviations**

CDM	Clean Development Mechanism
CSD	Commission on Sustainable Development
DUAC	Department of Urbanism, Architecture and Construction
GEF	Global Environment Facility
GHG	Greenhouse Gases
Gha	Global hectar per capita
LPA	Assisted Promotional housing (Logement Promotionnel Aide).
LPL	Public Rented Housing (Logement Public Locatif)
LPP	Public Promotional Housing Logement Promotionnel Public).
LSP	Social Participatory Housing (Logement Social Participatif).
LV	Rent to sell housing (Location-Vente).
MDGS	Millennium Development Goals
MHUV	Ministry of Housing, Urbanism and the city
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNFCCC	United Nations Framework Convention on Climate Change
UNCSD	United Nations Conference on Sustainable Development
UHI	Urban Heat Island
UNEP	United Nations Environment Programme
WCED	World Commission on Environment and Development
WSSD	World Summit on sustainable development

## **Chapter 1 : The Introduction.**

## **1.1 Introduction.**

The main aim of this chapter is to provide a brief introduction to the study; the main topic discussed in the research. In addition, it presents the research problem, its aims, objectives and hypotheses of the research. A brief description of the different chapters and sections is also included.

## **1.2 Background of the Study.**

In addition to enhancing human life and comfort, urbanisation and industrialisation have serious negative impacts on the environment. Global warming, industrial waste, and air pollution adversely affect the ecological balance (Memon, DENNIS, & LIU, 2008). As a result, Climate change has become one of the greatest challenges in the 21st century. It has been considered a significantly urgent and serious problem in the world.

North Africa, in particular Algeria, is highly vulnerable to climate change impacts, which disrupted its social and economic development (Adenle et al., 2017). In addition, an economic crisis was declared in the country in 2015, due to the perturbation of oil prices and because the country is so fiscally dependent on fossil fuels exports. In fact, Algeria is one of the countries that have a massive reservoir of fossil fuel resources and one of the major oil producers and exporters. It is also a major fossil fuel consumer as it was placed in 2013 within the biggest consumers of oil and gas in the world and Africa; the national energy consumption rate is rapidly increasing and it is estimated that the country reserves of natural gas and oil will only cover the next 50 years of the country demand of oil, and the next 70 years of natural gas (Haine & Blumberga, 2016).

The strong economic dependence on fossil fuels in Algeria has led to the development of both climate change adaptation and mitigation measures.

In Algeria, sustainable development and the awareness for energy efficiency is a new tendency but it is growing increasingly. The production of energy from renewable resources in particular solar energy, have become one of the main elements of energy policy in the country. In this context, a legal framework has been developed for promoting the use of renewable energies in order to cope with the future lack of energy resources and deal with greenhouse gas emissions. In 2015, Algeria was considered as the only North African country to explicitly develop comprehensive national adaptation and climate change mitigation measures (Nachmany et al., 2015).

However, sustainability measures are not yet considered in housing projects which make this sector a big consumer of energy and producer of waste. Also, the examples of good practice buildings remain very few in the country (Ali-Toudert & Weidhaus, 2017).

This research focuses on environmental, economic, social and cultural aspects influencing housing and urban design through a conduction of a comparative study between traditional courtyard housing built before the French colonisation of Algeria in 1830 and the housing stock produced in the country after the independence in 1962.

### **1.2.1 Sustainable communities.**

In recent years, the increase in the density of urban population and the concentration of economic and social activities in cities in addition to the inefficiency of the built environment has resulted to consider contemporary cities as a major consumer of natural and energy resources when 70% of the world's resources are being consumed in cities. Consequently, cities became a significant contributor to greenhouse gas (GHG) emissions and a source of environmental and social problems. As a result, metropolitan cities worldwide are engaged in a wide range of initiatives aiming to improve urban infrastructures and services in order to enhance the image of cities by creating better environmental, social and economic conditions (de Jong, Joss, Schraven, Zhan, & Weijnen, 2015).

In addition, the house is a multifunctional space and not only a fundamental unit in the town. It provides safety and shelter for inhabitants, but it is principally the place of human relationships, the place where people desire to get better life together (Akbari & Kolokotsa, 2016).

Sustainable communities afford the different needs of present and future inhabitants and contribute to a high quality of life. They are safe and well planned places where people desire to live and work, now and in the future. They offer equality of opportunity and good services for all residents. Sustainable communities must offer different daily facilities such as hospitals, schools, shops, and good public transport, clean and safe environment. Besides, they must offer public spaces where people can relax and interact. People also should have a role on the way their neighbourhood is run. However, the most important issue for sustainable communities that they must provide decent homes at prices people can afford. Today, sustainable housing has been a key issue of sustainable communities because the house affords private and personal space for individuals; also it is the place where resident identifies basic urban existence (Maliene & Malys, 2009).

The definitions of sustainable housing can take many forms; it can be defined as a structure that is safe and provide shelter for its occupants and an energy efficient, low cost construction that uses local materials or recycled materials (Perrucci, Vazquez, & Aktas, 2016). Another definition of sustainable house is the one that uses energy and materials more efficiently in the process of production and operation; it also reduces pollution and harm to natural systems (Straube, 2006). Consequently, the concept of smart, eco, green, sustainable has emerged recently and gained worldwide attention (Bibri & Krogstie, 2017). One of the important sustainable development goals of the United Nations is goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable (Haase et al., 2017). In fact the sustainable city should be a space that promotes a better quality of life and satisfy the needs of its citizens in a sustainable way. It is also socio-economically and ecologically sustainable in the long term by reducing resource exploitation and ecological impacts (Martos, Pacheco-Torres, Ordonez, & Jadraque-Gago, 2016).

Actually, the sustainability of cities could be achieved through the respect of sustainable development dimensions: Environmental sustainability, social sustainability and economic sustainability. Cultural sustainability is also an important issue that should be considered, experts and researchers in the World Summit on sustainable development, UNESCO, Agenda 21 were calling to include culture as a dimension of sustainable development in order to guarantee the continuity of indigenous local cultures. Also, culture determines human behaviour in different parts of the world (Ameen, Mourshed, & Li, 2015).

- **Environmental sustainability.**

Environment should be considered in the whole life cycle of buildings with specific emphasis on housing sector which is a major contributor to climate change, resource scarcity and pollution. Environmental sustainability provides the efficient use of resources, the use of renewable energies in addition to the protection of soil, water and air from contamination. In this context, housing industry should consider and implement the use of renewable energies as well as the efficient use of energy, water and materials. Housing construction should also consider ecology, conservation, air pollution, pollution control, indoor environmental quality and sustainable land utilisation management (Roufechaei, Hassan Abu Bakar, & Tabassi, 2014).

- **Economic sustainability.**

Sustainable cities must provide jobs and a variety of services in order to meet the needs of all its inhabitants. The city must attract public investment in different facilities. Also, the city should be managed by efficient administrative, financial well business oriented (in terms of simplicity of business, low taxes and good costs of doing business). In addition, cities should be able to receive new ideas and be an active participant in the global economy. Furthermore, the city must be connected with other cities and economies in the world in order to gain from the wealth of the global economy (PBRs, 2010).

- **Social sustainability.**

Social sustainability considers quality of life, health, transport, accessibility, aesthetics, safety and nuisance to neighbours. It also considers the benefits of both workers and future inhabitants. Social sustainability includes a number of elements which are basic human needs such as food and shelter, public facilities such as educational and healthcare centres, along with job opportunities and safe living and working conditions in order to enable future generations to have the similar or better access to social resources as present generation.

Social sustainability should provide a fair distribution of social benefits as well as policies and regulations that afford equal housing opportunities (Alobaidi, Rahim, Mohammed, & Baqutayan, 2015).

- **Cultural Sustainability.**

Cultural heritage and customs form the foundations of society, which make the preservation of local culture, traditions, and common values of different communities an important task for sustainable cities (Ameen et al., 2015).

### **1.3 Statement of the Problem.**

Algeria is the second largest country in Africa and its main population centres are located along the Mediterranean Sea coastline. This has created an unequal distribution of population between the North and South parts of the country. In addition, the migration of rural population since the independence of Algeria in 1962 looking for better living conditions in urban areas led to a huge increase in urban population which represented just 33.21% from total population in 1962 to 71.30% in 2016 (World Bank, 2017). Consequently, a serious housing crisis has resulted in the North. In order to deal with the housing shortage and the increasing demand in the housing sector, the Algerian government created different types of social and 'promotional' (luxurious) houses according to household incomes without any consideration of sustainability principles and expectations of future residents.

In fact, the housing sector has been blamed of causing serious environmental problems; ranging from excessive energy consumption, which represents 40% of total energy consumed worldwide to environment pollution (Roufechaei, Bakar, & Tabassi, 2014). On the other hand, traditional houses are an excellent sustainable design concept since traditional buildings were developed in response to cultural and climatic needs of the inhabitants. In fact, sustainable architecture aims to deal with the pressing environmental, economic and social problems of the world and minimise the negative environmental impacts of construction by improving efficiency and judicious use of materials, energy and space. In this context, the sustainable design of housing aims to reduce the impact on the environment and to ameliorate environmental quality (Roufechaei, Bakar, et al., 2014). The concept of sustainable housing focuses on the efficient use of energy and materials in the process of production and operation; and also the reduction of pollution and harm to natural systems (Straube, 2006).

There is a huge need to raise public awareness and public concern among sustainable buildings in Algeria. In addition, it is necessary to encourage professionals and stakeholders to improve and integrate sustainable design principles and techniques in housing developments. Indeed, future housing projects should fulfil the needs and consider the expectations of future inhabitants.

This research is concerned in studying the housing situation in Algeria and conducting a comparative study of three different types of houses: collective apartments, traditional courtyard houses and self-build houses in order to test the inhabitants' satisfaction of their dwellings. The research aims to provide suggestions and proposals for designers and stakeholders to help in the design of new sustainable housing in Algeria that considers local conditions and priorities with special emphasis on the city of Jijel.

### **1.4 Research aims, research questions and research objectives.**

The ultimate research aim is to investigate the aspects of traditional and contemporary architecture in Algeria which are suitable for the planning of sustainable settlements. The study will research the optimum configurations of design so that sustainability features of traditional design can be tailored with modern occupant expectations. In addition, sustainable houses should consider social and cultural backgrounds for occupants and should be designed in response to the real needs of the community and their concerns. Moreover, new settlements should be planned with respect to the current planning system: Urban codes and housing regulations in Algeria. Therefore, the research will aim to answer the following questions:

1. What is the current situation of the housing sector in Algeria?
2. Are professionals in Algeria aware of the sustainability issues?
3. Which features support sustainability in new and in traditional settlements in Algeria?
4. What do occupants want or find acceptable in terms of design?

The following objectives represent the above research questions:

1. To explore and understand the urban sustainability and the issues surrounding it by examining sustainability criteria.
2. To investigate the problems facing the housing sector in Algeria with special emphasis on the city of Jijel.
3. To investigate sustainable development through legislation in Algeria.
4. To investigate Building professionals' awareness in terms of sustainability.
5. To analyse traditional and contemporary housing in terms of exterior environment, comfort and residents satisfaction.
6. To identify the main features of new and traditional settlements in Algeria.
7. To examine occupants' expectations in terms of design.
8. To develop guidelines and recommendations for building new sustainable settlements in Algeria.

### **1.5 Research Hypotheses.**

To achieve these objectives, the following hypotheses will be tested:

1. Professionals are not aware as they should be in the topic of sustainability.
2. Traditional settlements are more suitable for the local population than modern residential group schemes.
3. It is important to integrate the future inhabitants' needs in future housing projects.

### **1.6 Justification and Significance of the Research.**

The Algerian government has developed a legal framework for promoting the use of renewable energies that reflects the increase awareness for energy efficient buildings. Despite the seemingly efforts made, the number of sustainable buildings and best practice housings is still significantly low in the country.

Only a limited amount of reliable research, either theoretical or empirical, was found that discussed the sustainability of housing design in Algeria. One of this research's strengths is being the investigation of the sustainability potential of traditional and present housing in Algeria to be applied in different types of new housing settlements; collective or individual projects. Outcomes will be used to formulate guidelines to build more sustainable housing projects. This research will focus in particular on the case of Jijel, a Mediterranean city located in the north east of Algeria. Despite its rich nature, moderate climate and tourism potential, the city suffers from lack of sustainability. Finally, this research provides a basis on which further local research can be conducted. Also, the results can be broadly appropriate to other MENA countries and can be used for future studies that examine the sustainability potentials of housing.

This research was conceived after the author experience in the built environment in Algeria; her academic background and her work as a practitioner architect in a private bureau of architecture and urbanism since her graduation and then in the Department of Urban Land Management since 2008, and most importantly in the Department of Housing in the city of Jijel. All these occupations and responsibilities has enabled her to witness all the problems facing the building sector and particularly housing. Also, this allows her to observe the lack of sustainability in new housing projects and its consequences. The research topic has changed from the study of the impact of climatic parameters in urban design in Jijel to the inclusion of sustainable housing in the same city. This is due to the growing interest of the author in the subject of sustainability. This had made the author recognises that there are more gaps and issues that have to be investigated and dealt with. All these issues have helped to the completion of this research.

## **1.7 Structure of the thesis and chapters layouts.**

This research is divided into nine chapters, including this introductory chapter.

### **Chapter 1: The Introduction.**

This chapter aims to provide a brief introduction to the study; the main topic discussed in the research. Also, it presents the research problem, its aims, objectives and hypotheses of the research. A brief description of the different chapters and sections is also included.

### **Chapter 2: Research Methodology and Literature Review.**

This chapter aims to provide a detailed description of the research methodology adopted in this research and the literature review. The chapter started by reviewing the research methodology of previous PhDs theses in the same research area in the Middle East and the Arab world. Then, the chapter presented the adopted Research methodology and its limitation. The second part of the chapter presented with the initial background literature review that led to the proposal of this project. It also investigates the main aspects of housing and urban planning in relation to sustainability and highlights the impacts of urban systems: The ecological footprint and the urban heat island, buildings and land use, traffic, quality of water, waste and pollution, fossil fuels and renewable energies.

### **Chapter 3: Housing policy and Housing situation in Algeria.**

This chapter aims to study housing policy and housing situation in Algeria in both historical and policy contexts. The chapter first presents a brief description of the township of Jijel including the location, climate and topography of the city. The chapter then investigates housing policy and the present housing situation in Algeria with reference to the city of Jijel. It also investigates the problems and obstacles facing housing sector.

### **Chapter 4: Study of Sustainability Aspects of Traditional Houses in Algeria.**

This chapter aims to investigate the different typologies of traditional houses and urban planning in Algeria with an emphasis on sustainability. The main objective of the chapter is to outline the different aspects and features of these typologies that are suitable for the planning of new sustainable settlements with special emphasis on courtyard houses in the medina of Constantine.

### **Chapter 5: Sustainable Design through Legislation.**

This chapter aims to investigate sustainable design through legislation. It starts by the study of the world's sustainability protocols. Then, it studied the sustainability legislations in Algeria. It aims to assess the efforts made to tackle climate change and then save the environment in the country. A survey questionnaire in the final and most important part of this chapter was conducted with an influential group of professionals and stakeholders that have a great impact on the built environment with special emphasis on the housing sector. The questionnaire aims to assess the knowledge and understanding of professionals in Algeria in the field of sustainability. The questionnaire also included the professionals' suggestions in terms of future housing design.

### **Chapter 6: Residents' Evaluation of their House Environment.**

The main aim of this chapter is to present the residents' evaluation of their housing environments. This chapter includes a general presentation of the different field studies: the three collective houses estates, self-build houses in Jijel and the courtyard houses in the quarter of Souika in the city of Constantine. Then, it presents the assessment of the external housing environments according to residents' responses. This includes different physical and nonphysical features such as: the distance from different amenities and services, the presence of green areas, children playgrounds and squares. Also, the level of security and measures undertaken by residents has been assessed.

### **Chapter 7: Residents' Evaluation of Spatial Comfort in their Houses.**

This part of thesis is related to the assessment of the extent to which the size of the different types of houses (Collective apartments, Self-build houses and courtyard houses)

also the size and the shape of the different living areas in the dwellings are appropriate to the resident's needs.

### **Chapter 8: Environmental Design Issues and Occupant Reaction.**

This chapter is concerned by the investigation of the environmental design issues and occupant reaction.

The first part concerned the residents' evaluation of thermal comfort, daylighting and the comparison of water and energy consumption in different types of houses. Acoustic comfort, air quality and privacy have also been assessed in this section.

The second part of this chapter is related to the study of occupants' reaction to the design where their satisfaction and preferences into the design of their houses are been presented. The third part presented the main results of the surveys that presented in previous chapter 7 and this chapter 8.

### **Chapter 9: Conclusions and Recommendations.**

This chapter concludes the present thesis and discusses the major findings. It presents a review of information and summarises the extent to which this research has achieved its objectives. It presents some suggestions and recommendations to help stakeholders and designers in developing strategies to create new sustainable cities that can achieve both residents' satisfaction and reduce negative impact on the environment. The chapter is concluded by a brief overview of the limitations of the research and its contribution to knowledge; the final section suggests areas for future research to enable the development of sustainable housing.

## **1.8 Conclusion.**

The first part of the chapter has built the foundation of the thesis; it has described the background of the study and has introduced the research problem, the research question, and the research hypothesis.

The lack of sustainability parameters in the existing housing stock in Algeria and the continually modifications in the external facades in different housing types had increased the author's interest in developing sustainable housing design and how to satisfy the need of future inhabitants.

This research may contribute to literature in different levels: the present situation of housing sector and the development of housing policy in Algeria, issues discussed (sustainable urban design, sustainable communities, sustainability legislations in Algeria, traditional housing in Algeria), the assessment of the building sector professionals' and stakeholders' knowledge and awareness in the topic of sustainability. Also, the evaluation of residents' satisfaction in different types of houses (the questionnaire survey). On of this research contributions is developing suggestions and recommendations to aid stakeholders and planners in the design of new sustainable housing in Algeria.

## **Chapter 2: The Research Methodology and Literature Review.**

## **2.1 Introduction.**

The main aim of this chapter is to provide a detailed description of the research methodology adopted in this research and the literature review. The chapter starts by reviewing the research methodology of previous PhDs theses in the same research area in the Middle East and the Arab world. Then, it presented the adopted Research methodology and its limitation. The second part of the chapter presents the initial background literature review that led to the proposal of this project. It also investigates the main aspects of housing and urban planning in relation to sustainability and highlights the impacts of urban systems: The ecological footprint and the urban heat island, buildings and land use, traffic, quality of water, waste and pollution, fossil fuels and renewable energies.

## **2.2 Overview of the Research Methodology.**

Research methodology is the choice of the best procedures, strategies and tactics for conducting research in order to reach certain kinds of results and answer the research question (Kitchener, 1999),(Hyland, 2016).

In this study, the author has first started by reviewing the research methodology of a number of other PhDs theses in Algeria, Middle East and the Arab world in order to concept the methodology of this research.

### **2.2.1 Review of research methodology of previous PhDs theses in the same research area.**

This section included a review of the methodology of research in six different PhD theses that studied the sustainability of traditional and contemporary houses in the Middle East and the Arab world.

Vaziritabar(1990) in his PhD thesis entitled "Design and Privacy in Modern and Traditional Housing in Iran" examined the privacy in housing design in the context of Iranian culture. In order to test the hypothesis of the research, the author developed a methodology to obtain the evidence required. The methods followed by the author were:

- Survey method for data collection: questionnaire survey and in-depth interviews of potential users of both traditional and modern houses.
- Analysis of organisation of spaces in dwellings through onsite work that was based on physical measurement and observation.
- The evaluation of previous works concerning privacy.
- Finally, statistical analysis of the information gathered and the presentation of major findings.

The author stated that: "The new housing architecture and urban design in the Middle East have been subjected to severe criticism for being architecturally international in style and concept, and socio-culturally alienating. It has often been argued that new buildings and settings lack many features of the old, and do not reflect or respond to the way of life of their inhabitants, neither historical nor contemporary"(Vaziritabar, 1990).The Author concluded that human behaviour and culture should be considered in housing design.

Magda Behloul in her research (1991): "Post Occupancy Evaluation of Five Storey Walk up Dwellings: The Case of Four Mass Housing Estates in Algiers"; aimed to develop guidelines and recommendations in order to enhance the design quality of future multi-storey housing projects in Algeria. The author assessed and compared the residents' satisfaction with their houses in four different estates. The author adopted a survey method for data collection by conducting questionnaire survey and in-depth interviews with 128 inhabitants of multi storey apartments in four different estates in Algiers.

The author stated that: "Instead of having had a process of adaptation of housing design to the local conditions and specific needs of Algerian households, it was rather the adaptation of the households to the new type of housing that was expected by the decision makers. An "average" size of dwelling has been decided upon for an "average" size of household. Inadequacies in the design of mass housing dwellings and the general layout of housing estates are thus likely to have occurred and to have been repeated over and over"(Behloul, 1991).

Behloul assessed the needs of residents and their expectation of design but her study was limited to multi storey housing in Algeria; yet the urban fabric of the majority of the Algerian cities is composed of a variety of housing types.

Noha Nasser in her research on urban design principles of a historic part of Cairo: a dialogue for sustainable urban regeneration, studied the historical and cultural urban process that affects the shape of the traditional city of Cairo.

The author adapted the following methodology:

- Data collection from libraries in London and Egypt.
- Literature review and analysis of previous work made on different historic periods of Cairo.

A physical field survey of the study area was carried out in 1999 in the historic city. This had involved mapping of building heights, conditions, construction types and land uses for each building. The results were compared with the data recorded in the 1937 Egyptian Survey Authority Maps.

A critical analysis of previous research conducted in similar fieldwork in order to correlate the data needed for a socio- economic survey that assesses the needs of the community and their concerns.

The author argued that future cities can be created by learning from historic and traditional cities: conserving cultural heritage and promoting sustainable development in order to suit contemporary needs (Nasser, 2000).

Abdulkader Ahmed Amer in his PhD thesis titled "Comparison Study of Traditional and Contemporary Housing Design with reference to Tripoli, Libya" focused on the important role of considering social and cultural factors, climate conditions and local building materials in designing new houses that can satisfy potential occupants. The author aimed to formulate guidelines in order to inform and help designers, planners, academics and stakeholders to design new housing forms that are suitable for residents without compromising their social and cultural activities (Amer, 2007).

In order to achieve the aims and objectives of this study, the author had adopted the following methodology:

- Literature Review included a general background of Libya as well as the cultural, social and religious influences on the design of Libyan houses. It also included a description of the traditional housing in Libya and a brief discussion of courtyard housing found in Iraq, Iran and Turkey in order to assess relevance outside Libya.
- The empirical study: Included collection of primary and secondary data which was adopted through direct observation and photographic survey. Also, the analysis of the data collected from potential inhabitants and professional actors.
- Preliminary conclusions and proposal of guidelines: Set of proposals and guidelines for housing design in Libya and other countries which share the same social and cultural values and similar climatic conditions. These guidelines have been tested by a group of international and local experts chosen based on their knowledge and expertise on housing design and construction.
- Recommendations and conclusions: Set of recommendations to provide a basis for a more successful formula for future housing design.

Al Zubaidi in her PhD thesis studied the sustainability potential of traditional architecture in the Arab world with reference to domestic buildings in the UAE. The author developed environmental and social sustainability assessment methods suitable to natural environment and social values of the region (Al-Zubaidi, 2007; Salman Al-Zubaidi, 2007). The research methodology included both qualitative and quantitative analysis of a number of traditional and contemporary houses in the UAE. The methodology adopted in this study was divided into three levels: Theoretical level, empirical level, and developing the assessment method.

**The theoretical level:** Literature review and analysis of secondary data including books, journals, magazines, archival data, field survey and observations in order to investigate the context of the research problem.

**The empirical level:** In this level of the study, the author carried out a comparative analysis of two traditional and contemporary case study houses, chosen out of ten. The author applied three techniques to collect primary data which are systematic analysis of the architectural drawings, quantitative analysis to the houses statistics, and direct observation.

**Developing the Sustainability Assessment Method (SAM):** This level of the research was carried out into two stages:

**Stage one (the proposed SAM):** In this stage, the author developed the preliminary framework of the proposed Sustainability Assessment Method through a theoretical investigation. It included the principles of the proposed SAM, the assessment criteria that define the SAM principle and the SAM rating system and evaluation criteria.

**Stage two (the final SAM):** In this stage, the proposed SAM was tested and then the final SAM was formulated.

Testing the proposed SAM was carried out at two levels. The first is to test the suitability of the proposed assessment criteria to express the professional and public codes. The second level is to test the appropriateness of the proposed SAM and its applicability in buildings. Finally, the final form of the tested SAM was refined.

However, the author did not conduct a survey to assess the inhabitants' requirements and their expectations in the design of future houses. She also based the cultural values purely on Islamic principles. The limitation is that Islamic principles are vast guidance to how Muslim should live and the application of these principles to daily life evolves over time.

The authors followed a logical approach in their research methodology through background research, collection and analysis of data where both qualitative and quantitative research methods were adopted and finally presentation of major findings and conclusions.

However, survey methods in order to consider inhabitants' needs and expectations were not conducted by both Noha Nasser and Maha Al-Zubaidi.

The main difference between the above-mentioned previous studies and this research is that here the focus is dedicated to different types of housing in Algeria adapting comparative analysis methodology between courtyard housing, self-build houses and collective apartments.

### 2.2.2 The Adopted Research Methodology.

The strategy of my research entitled "Sustainable Housing Design and Development in Relation to the City of Jijel, Algeria" is to examine the development of housing sector and urban design in the Algerian society over a period of time and its relationship to the aspects of sustainable architecture.

This research focuses on environmental, economic, social and cultural aspects influencing housing and urban design through a conduction of a comparative study between different types of houses: traditional courtyard housing built before the French colonisation of Algeria (1830) and the housing stock produced in the country after the independence (1962).

This research methodology involved carrying out quantitative and qualitative analysis (mixed method) for both traditional and contemporary houses in Algeria using comparative analysis through descriptive, qualitative, spatial analysis for the case studies and the use of survey questionnaire.

The mixed method enables the development of analysis in order to present richer data and to achieve greater confidence in the inferences produced by the evaluation study (Johnson, Onwuegbuzie, & Turner, 2007). Also, mixed method can provide better and stronger conclusions since it combines two methods that follow different philosophical and methodological approaches. A quantitative method approach follow a confirmatory approach and is used in order to test hypotheses (confirm or disconfirm), while a qualitative method is exploratory in nature (Taguchi, 2018).

The use of mixed method and the questionnaire survey which is combined with analytical and descriptive type questions permitted both inductive and deductive research to take place: Deductive research is testing priori hypotheses while inductive research is generalizing results from a sample to a larger population of interest (Woo, O'Boyle, &

Spector, 2017). Therefore, deduction involves moving from the general to the particular, by starting from a theory, developing hypotheses from it, testing those hypotheses, and correcting the theory. Induction, conversely, entails moving from the particular to the general, by making empirical observations about a phenomenon of interest and producing concepts and theories based on them (Woiceshyn & Daellenbach, 2018).

This study was first conducted in three different sites for collective apartments in Jijel from different periods of times (1970-1980), (1990-2000) and recent apartments (2005-2013) in order to assess the development of this type of housing over time. Then, the study analysed ten different contemporary individual houses or self-build houses in Jijel and other eight traditional courtyard houses in Constantine built before French colonisation to Algeria (in 1830). The city of Constantine was selected because Jijel was a prefecture of Constantine until 1974, and Constantine is the closest city to Jijel that still preserve its old Medina. The results of the analysis of the different types of houses have been compared.

The study is divided into three levels: Theoretical level, empirical level and the evaluation level.

- **The theoretical level:**

This level is based on collection of both primary and secondary data. This involved the collection, analysis and literature review of a variety of relevant documents related to sustainability and the built environment such as archives, books, PhD theses, journal articles, conference proceedings, reports, websites, official regulations' documents and urban plans that will be invaluable to this study. Malalgoda stated that: "the critical review of the literature helped to refine the initial research ideas and to gain a thorough knowledge in the area of the research"(Malalgoda, Amaratunga, & Haigh, 2018).

In this research, the literature review has helped the researcher to achieve in-depth knowledge on the broader area of "Sustainability and the built environment". The initial review of the literature helped the researcher to narrow down the area of study to the housing sector context (which is directly linked with the researcher's strengths, expertise and interests).

The theoretical level in this study included visits to traditional and modern settlements that have some sustainable design features and collection of information on examples of sustainable settlements – drawings, plans and images. Data collection also included the use of questionnaires and interview-based research. "The survey is a method of gathering information or data in a consistent or systematic way. Data can be collected from an entire population or from a sample of the population. While the former is referred to as census and is generally carried out by the governing authorities in ascertaining community or population specific statistics, the latter mode of getting data from a sample of population is often the general method of eliciting information in organisational and behavioural research"(Krishnan & Poulouse, 2016). In this research two different surveys were carried out: the first one was conducted with an influential group of professionals in order to assess their knowledge and understanding in terms of sustainability. While the second one was conducted with potential inhabitants of three different types of houses in two cities of interest: Jijel and Constantine, in order to assess the residents' satisfaction and their expectations in terms of design.

The data and documentary analysis aims to:

- Identify the background of the research problem.
- Determine the sustainability aspects that will be investigated in the empirical level of the research.

- **The empirical level:**

At this level of the research, the analysis of data collected from the theoretical level was conducted. Data analysis can be explained as a number of human practices made in order to understand, interiorize and interpret raw data and produce new knowledge based on this. However, Due to the amplitude of the term, there is no particular agreement about the definition of data analysis, but it could be described as the use of analytical and logical reasoning in the evaluation process of data in order to examine each element of the data provided. In this context, Data from a variety of sources is collected, reviewed, and then

analysed to provide results or conclusions (Martin-Rodilla, Panach, Gonzalez-Perez, & Pastor, 2018).

In this research, the analysis of the surveys was carried out and comparative analysis of different types of houses was presented. Three techniques have been employed in the comparative analysis: architectural drawings, housing statistics and direct observation. The comparison will be based on residents' satisfaction in terms of the design and location of their dwellings. This includes: the exterior environment, spatial and thermal comfort, housing preferences and housing satisfaction.

- **The evaluation level:**

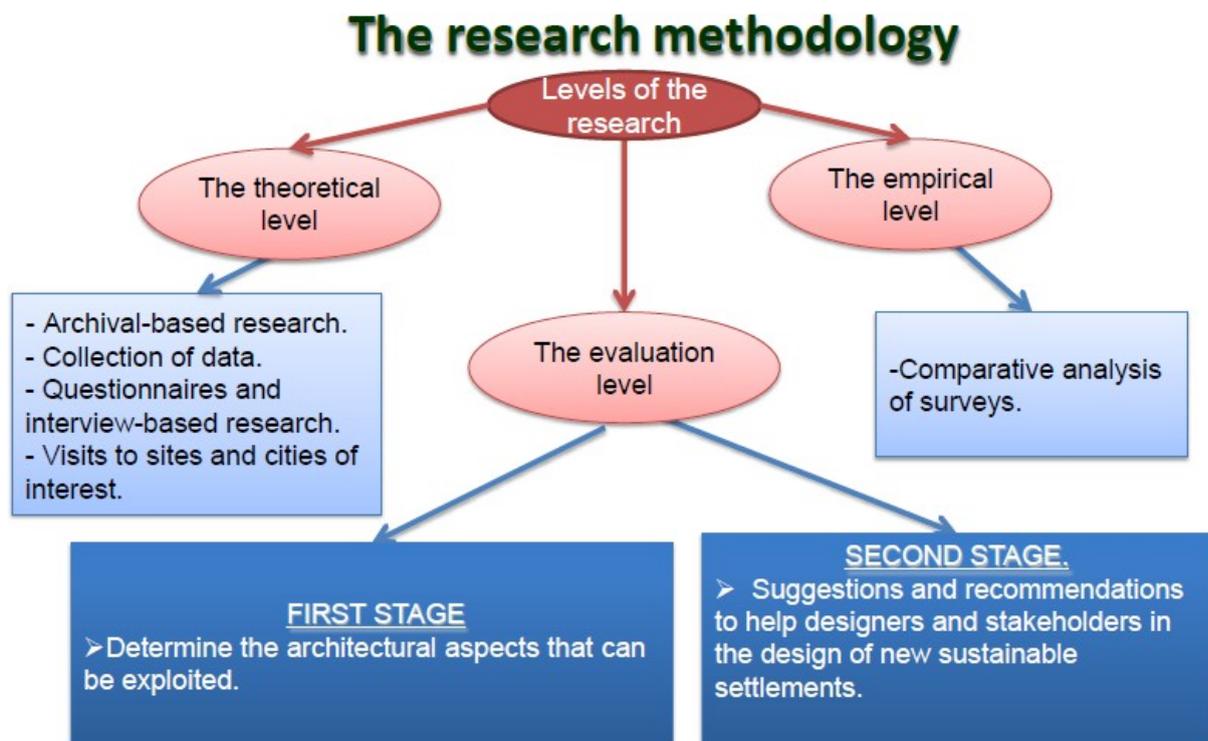
This process was carried out in two stages:

**First stage:**

Determine the sustainability aspects of traditional and modern design that can be exploited in new housing projects.

**Second stage:**

Developing suggestions and recommendations that can help designers and stakeholders in the design of new sustainable housing in Algeria.



**Figure 2.1: Research methodology.**

### 2.2.2.1 Surveys.

The term 'survey' is usually applied to refer to any activity designed to collect data from a particular population (Calder, 1998).

The 'Survey' method is one of the largest used research methods in social sciences; it is also one of the oldest. The use of survey as a method of gathering data was introduced in Ancient Egypt, and surveys on social conditions were being carried out in England in the 18th century. Modern surveys researches were popularised in the 1930 by pollsters (Hackett, 1981).

In fact, the survey method is considered as the best research tool to answer the question since questionnaires are practical to examine opinions or attitudes of a population (Thwaites Bee & Murdoch-Eaton, 2016). In addition, the questionnaire is a quick and an essential method of gathering a large amount of information (Behloul, 1991).

In this research, two different surveys have been conducted: survey with building professionals and survey with potential inhabitants.

### **A) Professionals' survey.**

The questionnaire with building professionals was carried out with forty architects and engineers working in either private bureau or public administrations in the township of Jijel (Department of housing, department of urbanism, architecture and the city, municipality of Jijel and the land management agency) all these departments are the influential actors of the design and urbanism in the city. This questionnaire aimed to assess the knowledge of architects in Algeria in terms of sustainability which can affect the quality of housing design and the sustainability of the built environment. It also sought views and understanding on differences between traditional and modern design of dwellings.

#### **• Questionnaire Design.**

In the present research, the information has been gathered through survey administered on paper distributed by the researcher herself (by hand) as the only available method of carrying a survey in Algeria and specifically in Jijel. It is true that professionals are widely using the internet; however, the Web or mails are not yet used as means of conducting surveys.

The survey questions in this study were developed as a result of an analysis of previous studies, discussions with many professionals in the field especially architects and literature review.

The present questionnaire contained a predetermined set of questions. Both Closed- ended and open-ended questions (Appendix 1). The open-ended questions give the opportunity to the respondents to suggest, think and be free to express their feelings and ideas without o be influenced by the researcher which allow the collection of valuable information (Tran, Porcher, Falissard, & Ravaud, 2016). For, the closed-ended questions, participants had to choose from a number of prearranged responses but sometimes he can add a response that is not included in the choices. In fact, the open-ended questions produce richer answers than the close-ended ones when the majority of respondents limited their responses to those already offered (Reja, Manfreda, Hlebec, & Vehovar, 2003). However, open-ended questions resulted to more invalid answers than close-ended questions. Invalid responses are then theoretically removed. Also, open- ended questions have generally larger item non-response in comparison to close-ended ones (Reja et al., 2003).

#### **• Pilot questionnaire.**

"Conducting a pilot test is one of the best ways to ensure that a questionnaire is designed properly and that the questions flow adequately. Pilot testing can be accomplished quickly with a very small sample and can reveal problems with a questionnaire before it is administered to the whole audience. This will alleviate potential confusion, which sometimes negatively influences participants' willingness to respond" (Phillips, Pulliam Phillips, Phillips, Stawarski, & Books24x, 2008).

In this context, a pilot questionnaire was tested-out on a small number of participants (seven) in order to identify questions that respondents have difficulty understanding and requiring more explanation or wording that was confusing or difficult to read or interpret differently than the researcher intended. The pilot questionnaire was conducted in January 2014 and then modified in order to be distributed to a more important number of participants.

#### **• Sample size.**

The sample research aims to allow generalising the data collected from a whole population by studying just a small portion of that population (Andres, 2012).

Cowles and Nelson stated: "If done properly, a sample can adequately replace the need to examine each item or individual in a population (sometimes referred to as the population or universe) in order to determine if a particular characteristic is present"(Cowles & Nelson, 2015).

According to Tran and colleagues (2016), the necessary sample size to obtain data saturation is difficult to be fixed even for experienced researchers. Many factors can affect the sample size: the subject and the aims of the study, the study participants, the existence of a recognized theory; data collection techniques; and the methods of data analysis (Tran et al., 2016).

In this research the sample was fixed according to the researcher's capacity to carry out the survey and to the number of professionals that would respond to the questionnaire in order

to guarantee a higher response rate. A considerable number of respondents are friends, colleagues and acquaintances of the researcher working as architects and engineers in different public administrations and private bureaus. The expertise of the author as a practitioner architect in housing and the built environment had allowed increasing the number of this category. This criterion of selection has helped to ensure more careful responses and to enhance the response rate.

- **Data collection.**

The questionnaire was conducted between February and April 2014 by the researcher to 40 professionals selected for the study. Targeted participants were those working in departments that have a direct impact on housing sector. The questionnaire was first translated into French which is the first foreign language in Algeria and the language that participants had normally used during their university's studies. Then, the questionnaire was distributed by hand to participants who were given sufficient time to answer and return their answers to researcher after a period of time that was previously determined by the participants according to their time and their ability to answer the questionnaire.

A cover letter was attached to the questionnaire in order to explain the purpose of the survey, include information on the university involved in the study and confidentiality assurance.

- **Method of analysis.**

After the collection of all responses for the questionnaires, the first step of data analysis was tabulating the data, which consisted of counting the number of times when an answer to closed-ended question was given by participants, in order to identify response patterns. All data collected were then programmed into Microsoft Excel software in order to be tallied up in graphs. For open-ended questions the data were reported by descriptive statistics.

## **B) Inhabitants' survey.**

"Accurate, up-to-date, and relevant data from household surveys are essential for governments to make sound economic and social policy decisions. Governments need these data to measure and monitor: poverty, employment and unemployment, school enrolment, health and nutritional status, housing conditions, and other dimensions of living standards" (Grosh & Glewwe, 2000).

The aim of the inhabitants' questionnaire in this thesis was to evaluate the inhabitant's satisfaction towards the design of their dwellings in terms of location, comfort and the respect of societal, social and cultural values. Also, the residents' preferences have been assessed in order to be taken into account in the design of future housing projects; a sample of the questionnaire is included in Appendix 2.

The study was first conducted in three different sites for collective apartments in Jijel from different periods of times (1970-1980), (1990-2000) and new apartments (2005-2013) in order to assess the development of this type of housing over time.

Then, the study analysed ten different contemporary individual houses or self-build houses in Jijel and another eight traditional courtyard houses in Constantine built before the French colonisation of Algeria (1830). The city of Constantine was chosen due to the importance of its old medina which was presented in details in next chapter 4, in addition to the lack of any kind of traditional houses in Jijel which was a prefecture of Constantine until 1974. The results of the analysis will be compared with those of collective apartments.

- **Questionnaire Design.**

In the present research, the information has been gathered in the city of Jijel through survey administered on paper distributed by the researcher. While in the case of the city of Constantine, the information was gathered through structured face to face interviews carried out by the researcher. This method was considered the easiest way to collect data and to guarantee a better response rate due to the difficulty to find the houses in the medina.

In developing the survey, a number of relevant questionnaires in previous PhD thesis were reviewed. These included the questionnaire conducted by Behloul (1991) in her thesis "Post Occupancy Evaluation of Five Story Walk up Dwellings: The Case of Four Mass Housing Estates in Algiers. Also, the questionnaire carried by Al Zubaidi (2007) in her thesis entitled "The Sustainability Potential of Traditional Architecture of the Arab World-with reference to domestic buildings in the UAE" and the work conducted by Daara (2009) in his Doctoral

thesis "Multi-storey housing estates in Constantine: a study of the relationship between design and behaviour"

The questionnaire was drafted in English and revised with my supervisors then translated into French language and sometimes further explanations in Algerian dialect were added to participants when necessarily.

The use of mixed method and the questionnaire survey which is combined with analytical and descriptive type questions permitted both inductive and deductive research to take place (Hesse-Biber, Hesse-Biber, Biber, & Hesse-Biber, 2008).

With analytical type questions such as: 'how many green spaces and trees are there in the estate or are there enough children playing areas in the estate?' the aim was to assess the inhabitants' estimation to the presence of such areas in the estates. These can be easily observed in each case study however the emphasis was on reliability of data (as the role of reliability is to minimise the errors and bias in a study(Yin, 2009)), usually the domain of positivist epistemology point of view resulting in deductive type research and the development of quantitative data (Woiceshyn & Daellenbach, 2018).

Descriptive type questions such as 'which organisation of the house do you prefer and why?' were used aiming to assess the inhabitants' preferences in terms of design and what is found acceptable for them. This is usually conducted to produce qualitative data through inductive type research and the use of interpretive epistemology approach (Hesse-Biber et al., 2008).

- **Pilot questionnaire.**

A pilot questionnaire was conducted with a small number of participants (nine) before the actual interviews in order to examine the suitability of the questions to respond to the research questions. Also, the pilot questionnaire was conducted in order to test the level of clarity of questions and to identify questions that respondents have difficulty understanding and requiring more explanation. The pilot questionnaire was conducted in January 2014 and then modified in order to be distributed to a more important number of participants.

- **Sampling Method.**

The method of sampling chosen in the present study is cluster sampling. This method has been selected due to the unavailability of a list of the total population surveyed. It consisted on the choice of the population units in groups or clusters (Cowles & Nelson, 2015). "Clusters are natural groupings of people... Cluster sampling involves obtaining a random sample of clusters from the population, with all members of each selected cluster invited to participate. It is necessary to construct a sampling frame listing all clusters in the population. A sample of a fixed number of clusters is selected at random from this list. Each cluster has the same probability of being selected, independently of all others. However, if the size of clusters varies then the probability of selection may be proportional to the size of the cluster, with larger clusters having a larger probability of selection. Obtaining a random sample of clusters can be time consuming, expensive, and impractical, not least because clusters will be diverse geographically. Therefore, cluster sampling sometimes uses a random sample of clusters from a conveniently selected geographical region" (Sedgwick, 2014).

This method is resulting in a multistage sampling procedure; the population was first selected randomly from blocks for collective apartments in each estate and clusters for individual and traditional houses. Then, from each selected block or cluster a number of households have been chosen at random.

In the case that a selected household is not available or refuse to answer the survey, the researcher chose another household from the same cluster or even from another cluster.

In this survey the sample was fixed according to the researcher's capacity to carry out the survey and to the number of households that would respond to the questionnaire.

- **The Questionnaire Parts.**

The survey instrument was divided into four parts:

- The first part which represent an introduction to the survey; contains general information about the houses such as the type of the house (Courtyard house or apartment) and the households such as the structure of household.
- The second part contains information about the estate in order to evaluate residents' estimation to the presence of public places.

- The third part consists of information of the houses; it takes into account comfort and energy consumption, privacy in the house and security.
- The fourth part aimed to assess residents' satisfaction and their preferences into design.

- **Data collection.**

Being a female researcher, it was hard to conduct -alone- interviews or get inside strangers houses. The company of a male was necessary for more security. So, I was always accompanied by my husband.

The questionnaire was conducted in three different phases:

The first phase was conducted between February and April 2014 by the researcher with ten households from each of the selected collective housing estates. The survey was carried out at weekends and in late afternoons after working hour to guarantee the presence of households. The questionnaire was directly distributed to participants who were given sufficient time to answer and return their answers to researcher after a period of time that was previously fixed by the participants according to their time and their ability to answer the questionnaire.

The second phase of the survey was carried out in Constantine in May 2015 with eight households of traditional courtyard houses of Constantine. The researcher carried out face-to-face interviews due to the difficulty to find the houses in the future. Also, the number of interviewees was limited due to the large number of households that refused to respond. Some families answered that they received a large number of researchers and students but without any amelioration of the situation of their houses; one of them talked to me roughly and told to me to just go out from his house. Others, they do not directly refuse but they thought there is nothing to talk about due to the miserable situation of their houses.

The third part of the survey was conducted with households of individual houses in Jijel between May and July 2015. The questionnaire was distributed to households selected randomly from different part of the city; they were given sufficient time to answer and return their answers to researcher after a period of time that was previously fixed by them. A cover letter was attached to the questionnaire in order to explain the purpose of the survey, including information on the university involved in the study and assurance of confidentiality.

- **Method of analysis.**

After the collection of all responses for the questionnaires, the first step of data analysis was tabulating the data, which consisted of counting the number of times when households gave an answer to closed-ended question, in order to identify response patterns. All data collected were then programmed into Microsoft Excel software in order to be tallied up in graphs and tables. For open-ended questions the data were reported by descriptive statistics.

- **Presentation of the results.**

Presenting survey results is one of the most important features of the survey process; it varies according to different disciplines and individuals; such as reading reports for social scientists and visual presentation for designers (Cowles & Nelson, 2015). In this research the results are presented as detailed written reports with graphic presentations in addition to the architectural drawings.

### **2.2.3 Limitations of the research methodology.**

Although the methodology of this research was carefully selected and prepared, some limitations were identified. These limitations included:

The first limitation is the sample size: the number of respondents was limited especially in the case of the medina of Constantine caused by the refusal of a large number of households to respond. Also, many houses were empty during the survey as they were under rehabilitation and their inhabitants were moved until the end of the operation. Moreover, the survey in this city was carried out face to face due to the difficulty to find the houses in the future; this has requested more time in collecting the data needed and reduced the number of houses surveyed.

The second limitation is the use of survey instead of an interview in the city of Jijel: the use of interview allows gathering new and more answers not included in the questionnaire. However, it would spend much more time and money in comparison with the survey. Also, the majority of respondents preferred to have more time to read the questionnaire, think about it and then answer.

The third limitation is the inability of conducting web survey: The web survey especially for the professionals' questionnaire would increase the sample size but the Web or mails are not yet used as means of conducting surveys in Algeria.

### **2.3 Initial Literature Review and Research Context.**

The aim of the literature review is to investigate the sustainability issues in both traditional and contemporary architecture considering its importance and value to the creation of new sustainable communities.

Al-Zubaidi referred to sustainability as improvements of the way people live and build, with more respect to the environment through efficient use of natural and renewable resources of energy without harming the nature or affecting the environment (Al-Zubaidi, 2007).

Sustainable architecture aims to deal with the pressing environmental, economic and political problems of the world and to minimise the negative environmental impacts of constructions by improving efficiency and judicious use of materials, energy and space (Eiraji & Nambar, 2011). Importantly, the excessive use of the term "*Sustainable Architecture*" in modern literature does not mean that sustainable building is a new concept. In fact, traditional architecture is an expression of sustainability since our predecessors built in harmony with nature, cultural background and social values of society (Al-Zubaidi, 2007). Many studies suggest that traditional houses are an excellent sustainable design concept since traditional buildings were developed in response to cultural and climatic needs of the inhabitants. For example, traditional settlements in the Algerian desert are a source of sustainable design principles because they are built compactly with locally available materials, with respect to thermal comfort and cultural needs of the local community (Bouchair & Dupagne, 2003). In addition, the traditional sunken courtyard buildings in Kuwait are suitable for the hot desert climate. This suitability was determined by energy efficiency of these houses, protection of buildings from fast deterioration and the comfortable environment created (Al-Mumin, 2001).

Sayigh and colleagues stated that passive techniques used in the design of traditional buildings in the desert are suitable to the harsh climate and able to provide thermal comfort to the inhabitants. On the other hand, the authors stated that contemporary architecture of the same region, influenced by western architecture, is not suitable for that climate. They proposed to combine lessons from traditional architecture and modern technology in building design (Sayigh & Marafia, 1998).

Eiraji and colleagues agreed with the previous opinion adding that it is so hard to live in the same way our ancestors used to live and it is definitely crucial to study and learn from their experiences and the sustainable systems they introduced (Eiraji & Nambar, 2011).

Also, the education of women and their integration in the society and in different fields of work has changed the relationship between women and men which consequently impacts on people's lifestyle and creates new social needs. Therefore, human behaviour and culture should be considered in housing design (Vaziritabar, 1990) and future cities should be created by learning from historic and traditional cities: conserving cultural heritage and promoting sustainable development in order to suit contemporary needs (Nasser, 2000).

Many researchers have studied traditional architecture in North Africa and the Middle East region with particular emphasis on cities in hot climate and the desert. However, there are many pressures that can reduce emphasis on sustainable design in developing countries; for instance over one billion people worldwide still lack adequate shelter and suffer from poverty (United Nation, 2012). Algeria is one example of a developing country facing a pressing housing shortage. The problem threatens cities with the spread of informal settlements and slums around all Algerian cities.

Therefore, this research project will first focus on identifying both qualitative and quantitative aspects of the housing crisis in the country. Also, this research will investigate

the different features of traditional and contemporary housing in Algeria that are suitable for the planning of new sustainable settlements. These aspects will help to formulate guidelines for sustainable housing design in terms of: residents' satisfaction, consideration of climatic parameters and low impact on the environment. The research will primarily focus on Jijel, a Mediterranean city located in the north east of Algeria.

### **2.3.1 Sustainable urban design.**

Urban planning has been defined as a science that aims to organise lands in scientific, aesthetic and orderly manner. It also aims to produce good physical, social and environmental conditions in addition to enhancing the health and wellbeing of communities (Haine & Blumberga, 2016).

The rate of urbanisation has been increasing in the last 50 years and now approximately half of World population is living in urban areas and it is estimated to reach 70 per cent by 2050. In addition to enhancing human life and comfort, urbanisation and industrialisation have serious negative impacts on the environment and thereby our day to day life. Global warming, industrial waste, and air pollution adversely affect the ecological balance (Memon, DENNIS, & LIU, 2008). Consequently, cities have becoming areas of big consumption of various resources and realising contaminants (Bokaie, Zarkesh, Arasteh, & Hosseini, 2016). In fact, cities are also responsible for emissions of almost 80% of the total greenhouse gas (GHG), where 25% of these emissions resulted from urban transportation, 32% from urban built environment, and about 5% to municipal solid waste (Ferrer, Thomé, & Scavarda, 2016). Urban sustainability is important in reducing these negative effects of urbanisation.

The most common definition of urban sustainability is "the state a metropolitan community reaches once it is able to meet the needs of the present generation without compromising the ability of future generations to meet their own needs". This definition was first used in 1987 in the Bruntland report entitled "Our Common Future" published by the United nation's World Commission on Environment and Development (WECD, 1987).

However, the concept is not as simple as this definition; it is more complex to be implies in practice and much more difficult than one might expect to be applied to real-world human settlements (Choguill, 2007).

Sustainability should intend for ecological balance not only in each neighbourhood but in a whole urban region. Moreover, urban communities should aim to achieve high-quality physical environments, social equity and economic viability.

### **2.3.2 The impact of urban systems.**

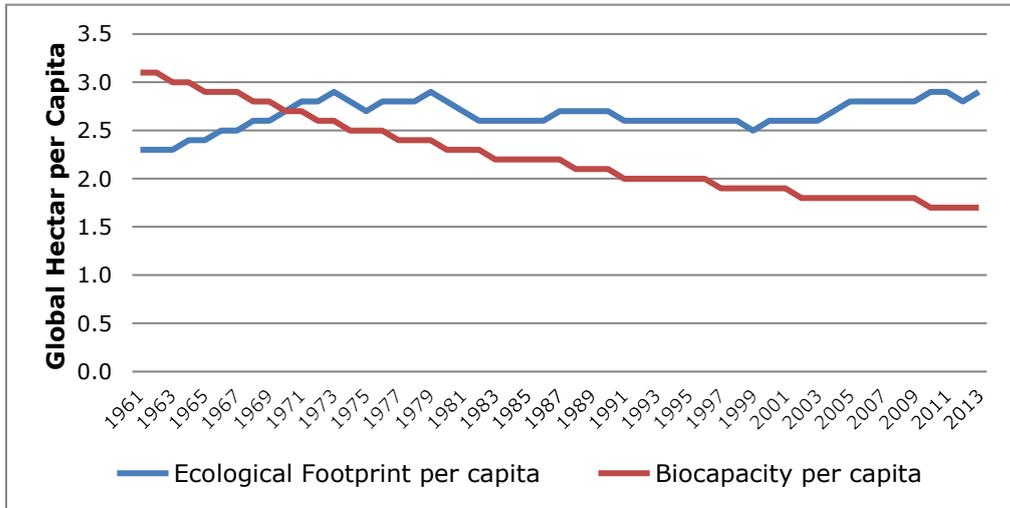
Urban sustainability is based on the quality of the urban systems and their impact on the regional and global environment (Alberti, 1996). The transformation of infrastructure systems is crucial to create sustainable, resource-efficient cities. In this context, the United Nations Environment Programme (UNEP 2012) set five infrastructure areas for achieving resource efficient cities: energy efficiency, waste management, sustainable urban transport, water/wastewater, and urban ecosystem management (Kennedy, Baker, Dhakal, & Ramaswami, 2012). The next section of this chapter explains the effects of these infrastructures with reference to Algeria in order to investigate the position of the country in terms of urban sustainability.

#### **2.3.2.1 The Ecological Footprint.**

The concept of the Ecological Footprint was designed and developed in 1996 by William Rees and Mathis Wackernagel (Sassi, 2006). It is based on the comparison between the demand for natural resources and biocapacity (resource supply) of the planet (Dunster, Simmons, & Giblert, 2008). In other words, it calculates the amount of land and sea area required to sustain human life, in the long term, by providing the resources needed (such as: food, water, shelter and energy) and absorbing the wastes generated (including carbon dioxide). The Ecological Footprint is expressed in global hectares or in global acres for the US calculator (The Global Footprint Network, 2012).

The Ecological Footprint is essential since global economy is sharply growing and a surplus of 30 percent of natural resources (that can be reserved) is consumed each year. As a

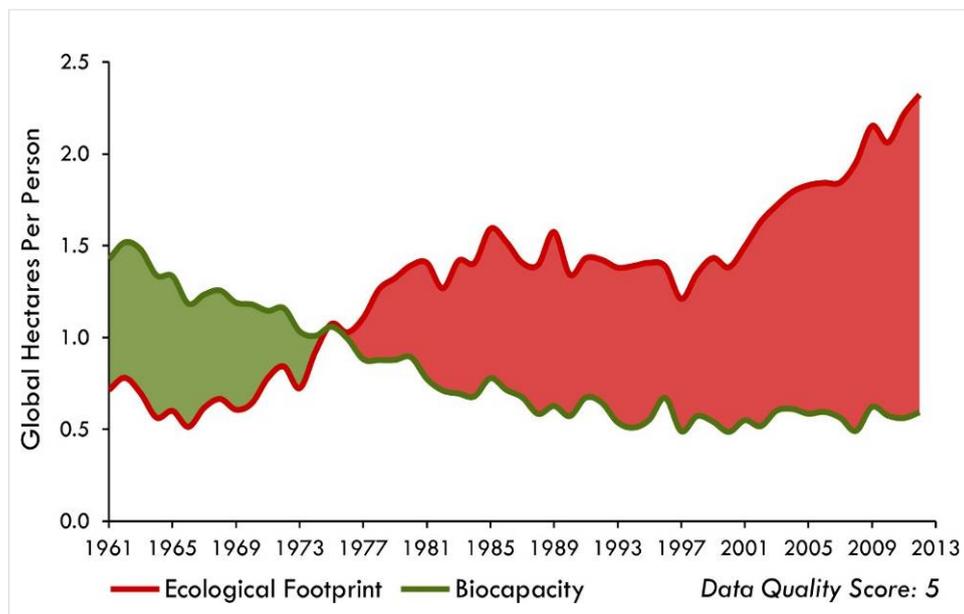
result, 1.5 planets are required to provide for human needs (WWF, 2012). Figure 2.2 shows a sharp degradation in world biocapacity and perturbation in the Ecological Footprint between 1961 and 2013.



**Figure 2.2: World ecological footprint and biocapacity between 1961-2013 (Source: based on The Global Footprint Network report, 2017).**

Although, Africa’s rate of urbanisation is the highest in the world (Clancy, 2008), African countries have the lowest ecological footprints consumption in the world with 1.4 gha (Global hectare per capita) which is lower than the world’s average (2.7 gha). Nevertheless, Africa still had an ecological deficit of 0.1 gha.

Algeria is one of the largest African countries with 2. 381. 741 Km<sup>2</sup> and a population of 37.1 million inhabitants by January 2012 (ONS, 2016). It has an ecological footprint of 1.6 gha and an ecological deficit of 1 gha (The Global Footprint Network, 2012). Figure 2.3 shows a sharp decrease in biocapacity in Algeria to less than 0.6 gha which is less than the world average (1. 7 gha).



**Figure 2.3: The Ecological Footprint and Biocapacity in Algeria between 1961 and 2013 (Source: The Global Footprint Network, 2017).**

### 2.3.2.2 Buildings and land use.

Buildings and land use are crucial to all human activities and they are considered to be the skeleton of the urban fabric. In the last decades, it became an important issue attracting policy-makers and scientists. Land is affected by many problems emerging from global

climate change, deforestation, desertification, biodiversity defeat, decrease in human quality of life, pollution and so on. The most common effects of excessive land exploitation are soil erosion, loss of habitat, raised vulnerability of the soil, decline in the carrying capacity of land, landscape modification, and loss of natural amenities (Nijkamp, Rodenburg, & Wagtendonk, 2002).

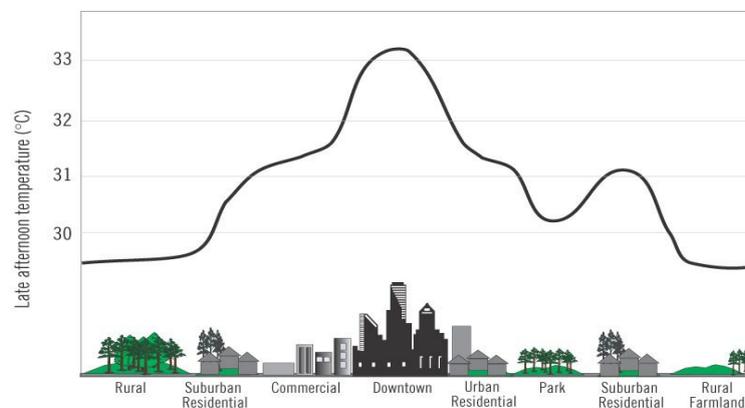
The form of land use varies between cities according to various conditions such as: terrain conditions, populations' density, legal restrictions and cultures. The difference can be shown by comparison between high and low populated cities. The first one has a compact urban fabric, mixed and efficient. However, cities with low population density have a rational land use that can afford suitable living services to citizens.

Sustainability of land use particularly in metropolis with high densities can be shown in the sustained capacity of supporting the future urban development with limited land resources (Wang, Zhang, & Skitmore, 2015).

In addition, buildings and their activities are responsible of approximately 31% of world energy consumption, about one-third CO<sub>2</sub> emissions, around two thirds of halocarbon, and about 30% of black carbon emissions (Felgueiras, Martins, & Caetano, 2017).

The Urban Heat Island (UHI) is a rising risk that faces humanity in the 21<sup>st</sup> century due to the uncontrolled growth of urbanisation and industrialisation (Bokaie et al., 2016). A heat island is a region with an ambient temperature that is higher than its neighbouring land (Brophy, O'Dowd, Bannon, Goulding, & Lewis, 2000). It is the maximum difference in the ambient temperature between an urban area and the rural area surrounding it (M.Kolokotroni, I.Giannitsaris, & R.Watkins, 2005). The temperature of cities is rising even if the global climate is not getting warmer.

The main causes of UHI are the heat generated by various heat-generating sources such as the solar radiation consumed and re-radiated by urban structures and the anthropogenic heat sources such as vehicles, power plants and air-conditioners (Memon et al., 2008). These sources produce carbon dioxide and other pollutants that cause the "greenhouse effect", thereby leading to an increase in the global temperature which affect the outside comfort and increase energy consumption (Brophy et al., 2000). Figures 2.4 shows temperature variations between urban and rural areas.



**Figure 2.4: urban heat island (Source: EPA, 2008).**

To reduce the effects of urban warming, there is two different technologies that have been researched: the first one aims to increase solar reflectance, by minimising the absorption of solar radiation in urban environment using materials with high solar reflectance in order to keep surfaces cool. These materials can be used in the building's facade, roofs, and pavements. These materials are known as cool materials; they reduce the surface temperature of the urban areas and decrease the release of rational heat to the atmosphere. The second technology aims to increase evapotranspiration in the urban environment. This may be reached by the use of urban green areas such as urban parks and green roofs; and the use of water-permeable pavements (Akbari & Kolokotsa, 2016).

Also, green (Sustainable) buildings is a new concept that aims to reduce the negative impacts of buildings on natural environment and human health by integrating sustainability principles and techniques to the different stages of buildings' lifecycle: design, construction, the use, rehabilitation or demolition. Sustainable buildings could be achieved through two

different approaches: the first one is the construction of new green buildings, which will improve the quality of the built environment produced; the second approach is the sustainable rehabilitation and renovation of existing buildings. There was a growing interest of sustainable construction and renovation of buildings in Europe in the last decades. The main results of this interest are the initiation of green buildings councils and introduction of environmental assessment methods to assess environmental performance of buildings (Balaban & Puppim de Oliveira, 2016). Algeria as one of the developing countries can learn from the experience of Europe and other developed countries in order to reduce the effects of urbanisation on the environment.

### **2.3.2.3 Traffic.**

Due to the expansion of urban areas and the rapid rate of urbanisation, urban transport and the use of cars has become a necessity in our daily lives. Transport system provides the flow of resources and products, relating organisations and people, facilitating everyday life and economic development. It can be described as the 'blood system' of global economies. This in turn has an immense impact on the environment through the reduction in the quality of air and the exhaustion of non-renewable energies (fossil fuels) (Robért, Borén, Ny, & Broman, 2017).

In fact, transport sector is not the most important polluting source in the world, but it represent thirteen percent of total GHG emissions which is increasing rapidly and it is estimated to double by 2050 if no action is undertaken (Eliasson & Proost, 2015).

Sustainable transport can be defined as "satisfying current transport and mobility needs without compromising the ability of future generations to meet these needs". The aim from the concept of sustainable transport is to control pollution, energy consumption, accidents and improving liveability and economic well-being of the city. Sustainable transportation also involves balancing current and future economic development, transport qualities and environmental preservation (Rajak, Parthiban, & Dhanalakshmi, 2016).

Since more than 10 years, all European countries have implemented a sustainable transportation policy that has strong fuel economy targets for cars and legislation including sanctions for noncompliance in order to decrease emissions of new cars from 180 g/km to 90 g/km in 2021. Also, they integrated some binding commitments to increase the use of renewable energies in transport systems (Eliasson & Proost, 2015).

In the case of Algeria, a new transport system is being developed in order to reduce emissions resulted from non-electric transportation. This new transportation networks aim to provide access to isolated areas by prioritising electric rail transport and to increase the existing 4,000km of rail track to 11,300km by 2020. In 2011, a metro system has been opened in the capital Algiers and tramway networks were opened in the two major cities of Oran and Constantine in 2013. Recently, several train workshop vehicles in Algiers are powered by electricity and around 350m<sup>2</sup> of solar panels have been installed on the maintenance sheds for commuter trains (Nachmany et al., 2015).

### **2.3.2.4 Quality of Water.**

Human settlements and activities have always been centred near freshwater. In fact, freshwater is the main natural resource to the development of human activity, as it is crucial to human life and wellbeing. Also, water is an important factor in most production sectors; economic, environmental and social asset.

Actually, the access to clean water and sanitation is considered by the United Nations as a human right in itself (Pellicer-Martinez & Martinez-Paz, 2016).

In fact, the use of natural resources such as water by direct use or by production has negative impact on the environment, such as resource overuse and/or pollution.

In 2014, more than half world population were living in cities which lead to a major problem of water depletion in rapidly urbanised cities particularly in developing countries. The United Nations estimated that by 2025, two thirds of the world population could be facing a water stress and nearly 1.8 billion people will be living in countries with water shortage (Naimi Ait-Aoudia & Berezowska-Azzag, 2016).

Although the supply of water rose between 1990 and 2008, the growth of the global urban population affected those results; 1052 million urban dwellers had access to enhanced

drinking water when the urban population in that period increased to 1089 million people (UN Water, 2014).

Therefore, urban sustainability is affected by two main issues related to water which are: the lack of access to improved water, and the increase of disasters related to water. These challenges have massive effects on human health and well-being (UN Water, 2014).

In order to reach a sustainable use of the world's water resources, countries should collaborate in a way to share a source of water, ensure that water is used efficiently and pollution is significantly reduced.

Algeria is one of the countries that are affected by water stress. According to the United Nations Organisation, the natural water supply in Algeria is lower than 500 cubic meters per capita per year and is considered in absolute scarcity.

### **2.3.2.5 Waste and pollution.**

The increase rate of waste production is a direct result of the increase rate of urbanisation. It is also related to economic and demographic development. Indeed, the improvement of human life style has negative impacts on the environment and economy of many countries (Bougherira et al., 2014).

In Algeria, the rapid rates of urbanisation in addition to the rise in the average households' incomes and the change of life habits of local population have led to an important increase of the average quantity of waste generated per capita. In fact, the average daily amount of waste produced per person nearly doubled in the last three decades, from 0.63 kg/capita/day in 1980 to 1 kg/capita/day in 2010. It is expected to increase to 1.25 kg per capita in 2025. In 2012, the total amount of waste generated was almost 10.3 million tons when 85% of this waste was resulted from domestic and commercial use and the rest 15% was generated by industry. This waste can be recovered to produce bioenergy. The electricity produced from this energy could provide the annual needs from electricity for more than one million people (Akbi, Saber, Aziza, & Yassaa, 2017).

In fact, sustainability is a crucial issue that should be dealt in waste management systems. The Algerian government should set legislations and policies in order to integrate waste recovery and recycling in order to reduce the harmful impact of waste on both environment and the economy of the country.

### **2.3.2.6 Energy.**

Affordable energy has been the skeleton of modern life. This has led to a sharp rise of energy consumption and scarcity of natural resources. This issue has made energy security one of the crucial factors to reach a secure and sustainable international regime (Brutschin & Fleig, 2016).

Fossil fuels (coal, oil and gas) are essential sources of non-renewable energy. These fuels are burnt in power stations to produce electricity along with large quantities of harmful gases such as Sulphur dioxide, Nitrogen oxides and Carbon dioxide. These significantly contribute to global warming and fall of acid rain (Ediger, Hoşgör, Sürmeli, & Tatlıdil, 2006). These emissions are intended to be increased in the next two decades by around 30% if no actions or strong mitigation policies would be taken (Foster et al., 2017).

Algeria is one of the major oil producers and exporters when one-sixth of the total oil production is consumed at home and the rest is exported as crude, liquefied petroleum gas (LPG) or refined oil. In fact, Algeria is one of the countries that have a massive reservoir of fossil fuel resources. In 2013, Algeria had the tenth greatest natural gas stock in the world and the second in Africa. Also, it had the seventeenth greatest oil reserves in the world and the fourth in Africa (Amri, 2017).

Algeria is also a major fossil fuel consumer as it was placed the thirty-sixth biggest consumer of oil in the world and the third one in Africa in 2013. Also, it was one of the first twenty-six biggest consumers of gas in the world and the first in Africa when 42.61% of total energy consumption was consumed in residential sector represented the biggest consumer sector, 36.03% in transportation and 21.35% in industrial sector.

Furthermore, the energy consumption rate is rapidly increasing by 1% per year. It is estimated that the country reserves of natural gas and oil will only cover the next 50 years of the country demand of oil, and the next 70 years of natural gas (Haine & Blumberga,

2016). Consequently, Algeria will probably lose its position as a major fossil fuel exporter by mid-2030, if the government could not provide other energy resources that can cover local and international exportation needs. That will lead to serious economic problems to the country since it is fiscally dependent on fossil fuels exports (www.reeep.org, 2011). In this context, the Algerian government introduced a new program to develop renewable energies since February 2011. The program was revised in Mai 2015 and then classified in the range of national priority in February 2016. This program intends to cope with the future lack of energy resources originating from fossil fuels and deal with greenhouse gas emissions. The program consists on the use of renewable energy technologies such as: wind, geothermal, biomass and solar energy. Algeria plans that by 2030, 27% of its energy will be produced from renewable resources and 60% of its CO<sub>2</sub> emissions will be reduced (Ministry of energy and mines, 2017).

### **2.3.3 Traditional housing, Collective housing and self-build housing.**

Traditional architecture is an expression of sustainability as our predecessors built in harmony with nature, their cultural background and social values of their society (Makani & Talebi, 2011). In addition, traditional houses have been built with consideration to climatic conditions and local building materials in order to satisfy potential needs (Amer, 2007). Besides, traditional settlements are a source of sustainable design principles because they are built compactly with locally available materials, with respect to thermal comfort and cultural needs of the local community (Bouchair & Dupagne, 2003). For example, the traditional courtyard buildings in the desert of the Arab region are suitable for the hot desert climate. This suitability was determined by energy efficiency of these houses, the protection of buildings from fast deterioration and the comfortable environment created (Al-Mumin, 2001).

Due to its strategic location, Algeria was the destination of several conquests and has known several successive invasions. This has resulted to a contact with many cultures, the fact that created new cultural, commercial and demographic inputs (Mechtoub, 2001). In addition to the large area of the country (2 381 741 square kilometres) and the different climatic zones: Mediterranean, Semi-arid and Arid climates (Presidence de la republique, 2013), this explains the variety of traditional dwellings across the Algerian territory.

Traditional houses in Algeria according to Benmatti can be divided into three categories:

- The first category grouped the courtyard houses in the towns of the North (Medinas). This study will research the medina of Constantine.
- The second type is less homogeneous than the first category and includes houses of rural and semi-urban areas of the North; the research will focus on the example of Kabylia.
- The third category concerned housing settlements in the South. The study investigates the examples of M'zab, Souf and Hoggar (Benmatti, 1982). These will be described in next chapter 4.

Industrialisation in the most recent 250 years caused a rapid rate of urbanisation which in turn affected the nature and form of urban areas. The industrial revolution that started in Western Europe in the second half of the eighteenth century drew more people to live and work in towns and cities which significantly increased urban population proportions from 10 to as high as 90 percent. This factor caused the need to house workers and fit the largest numbers of people into the smallest space (Pitts, 2004). In addition, the destruction of cities during the First and the Second World Wars increased the need to accommodate people after the war, which led to the emergence of collective housing (Daara, 2009).

In Algeria, multi-story housing has spread rapidly after the Independence in 1962 in all the Algerian cities as a result of the severe housing crisis that confronted the country during this period. This dilemma was caused by the massive rural exodus of people who desired better accommodation and improved living conditions in urban areas. The socialist

government at the time considered this problem as a major issue which resulted in the initiation of major programmes of social multi-storey housing estates (Daara, 2009).

The housing crisis in Algeria (which has extended over several decades) was caused by rural exodus to towns, the rising rate of births, and the inability of public housing projects to respond to people's needs in terms of quantity and quality of housing. This crisis is represented by the immense imbalance between the offer and request. The imbalance can be shown by a simple comparison between the number of those seeking accommodations and the offer in any type of public housing projects.

Due to this severe situation of housing in the country and the incapability of the Algerian government to face the increased number of housing demands, new informal settlements have emerged in the cities, generally in the periphery. Not only low-income households coming from rural areas are adopting this kind of housing, but middle income and wealthy families have resorted to this type of self-build dwelling, which has resulted in the creation of a new form of multi-story family buildings (Belguidoum & Mouaziz, 2010).

Self-build dwellings can be defined by one of these characteristics:

1. **Informal:** continuous and progressive change without any consideration to the "form".
2. **Spontaneous:** constructed in a spontaneous manner based on the inhabitants needs.
3. **Sub-integrated:** often occupied by a population originally coming from rural regions.
4. **Illegal:** because it is constructed without an administrative authorisation or permit of construction (Mammeri, 2011).

## **2.4 Conclusion.**

The first part of the chapter has presented the methodology adopted in this research.

The second part of the chapter that reviewed relevant literature; showed the huge need for making cities sustainable. It is concluded that in spite of the amount of research that addressed the sustainability issues in building sector particularly housing, little has been written about the context of sustainability and sustainable architecture in Algeria with special emphasis on housing sector. Such acknowledgement, if available, would reduce the housing crisis in both qualitative and quantitative levels. Also, this would reduce the impact of housing on the environment.

This chapter has investigated sustainability concept and its relation to the built environment with special reference to Algeria. This has highlighted the impacts of urban systems: The Ecological Footprint, the Urban Heat Island, buildings and land use, traffic, quality of water, waste and pollution, fossil fuels and renewable energies. Although, Algeria is one of developing countries that have an ecological footprint and biocapacity decrease lower than the world's average, the country still need to cooperate and make more efforts in order to reduce the negative impacts on the environment. In fact, Algeria plans that by 2030, 27% of its energy will be produced from renewable resources and 60% of its CO<sub>2</sub> emissions will be reduced but this still not enough in comparison to the richness of the country from renewable energies resources.

## **Chapter 3 : Housing Policy and Housing Situation in Algeria.**

### 3.1 Introduction.

Worldwide, 40-percent of all energy used by humans is consumed in building sector. The increase need to make our buildings more efficient can be explained by the reduction of natural resources, national security, environmental concerns, climate change, social justice, and rising costs (Ramsdell et al., 2015). In this context, most developed countries were oriented to research and design 'energy efficient buildings' or 'green buildings' since the energy crisis of 1970 (Zhu & Lin, 2004). There are many pressures that can reduce emphasis on sustainable design in developing countries; for instance over one billion people worldwide still lack adequate shelter and suffer from poverty (United Nation). Algeria is one example of a developing country facing a big pressing housing shortage. The problem threatens cities with a large spread of informal settlements and slums and is spread all around the Algerian cities. Consequently, this chapter aims to research the housing situation in Algeria in both historical and policy contexts. The chapter first presents a brief description of the township of Jijel including the location, climate and topography of the city. The chapter then investigates housing policy and the present housing situation in Algeria with reference to the city of Jijel. It also investigates the problems and obstacles facing housing sector.

This chapter strive to answer the following research question: What is the current situation of the housing sector in Algeria?

### 3.2 Presentation of the province of Jijel.

#### 3.2.1 Location and area.

The province of Jijel is located in the north east of Algeria, at about 25° East, and 36° North. The region belongs to the domain Atlas North known locally as the 'Chain of Babors'. Jijel is bordered by Mediterranean Sea with a coastline of 120 km, it is limited by: Mediterranean Sea in the North with a maritime facade along 120 kilometres, the province of Skikda in the East, the province of Bejaia in the West and the province of Setif and Mila in the South.



Figure 3.1: Location of Jijel.

Jijel was a sub-prefecture of the province of Constantine until the administrative zoning of 1974 when it first had the status of province. Jijel actually is administratively divided into 28 communes and 18 sub-prefectures (Dairas)(Wilaya de Jijel, 2017).



**Figure 3.2: Location of Jijel (Source: Department of tourism).**

Jijel has a total area of 2,400 km<sup>2</sup> of which 82% are mountains, and an estimated population of 653,272 inhabitants according to the General Census of population and Habitat of 2009; when the large part of population is concentrated in the north part of the province. In particular the city centre of Jijel, Taher and El Milia gathered together a number of about 300,000 habitants or 46 % of the total population (DPAT, 2016). The actual City of Jijel has an estimated population of 152,113 inhabitants and occupies just 62 km<sup>2</sup> (2.6%) of the land area of the province, and this results a high density of population of 2,453/km<sup>2</sup> (when the average density is just 304 persons/km<sup>2</sup>). Also, the housing rate occupancy in the city is 5.33 which is higher than the country average 4.86 (Housing department, 2016).

### 3.2.2 Climate.

Jijel enjoys a temperate climate with mild wet winters and hot dry summers typical of a Mediterranean maritime climate. The rainy season lasts six months with an annual rainfall of 1200 mm which make the city the wettest region in Algeria. The temperature is very mild in Winter (11°C on average in January) and the heat is tempered by sea breezes in Summer (26°C on average in August). Table 3.1 shows temperature variations in Jijel marked in 2009.

Months	The average temperature in °C	The average of maximal temperature in °C	The average of minimal temperature in °C
<b>JANUARY</b>	11.9	15.9	7.6
<b>FEBRUARY</b>	11.6	16.0	6.8
<b>MARCH</b>	13.2	17.9	7.8
<b>APRIL</b>	15.2	19.3	10.9
<b>MAY</b>	20.8	25.3	15.7
<b>JUNE</b>	23.6	28.7	17.5
<b>JULY</b>	27.4	32.8	21.6
<b>AUGUST</b>	26.9	31.8	21.8
<b>SEPTEMBER</b>	23.4	27.6	19.0
<b>OCTOBER</b>	20.2	24.6	15.7
<b>NOVEMBER</b>	16.5	22.1	11.1
<b>DECEMBER</b>	14.7	19.3	9.9

**Table 3.1: Average temperature variations in Jijel during 2009 (Source: ONM).**

The prevailing winds come from the northwest in winter and from the north-east in summer. The rate of high humidity can reach an annual average of 72% in summer and over 75% in winter (Wilaya de Jijel, 2017).

### **3.2.3 Topography.**

The county town of the province has a total area of 65.66 km<sup>2</sup>. It consists of a coastal plain surrounded by Mount Mezghitane (300 m), the mountainous area of Beni-Caid in the south and Mediterranean Sea in the north. The valley of Oued El Kantara cuts the plain on the east side of the city, the urban territory extends to the river Mencha in the East and Kissir Oued in the West.

Based on geological and geotechnical studies done in the region, Jijel is an area subject to earthquakes; the city was destroyed in 1856 by a violent earthquake (Wilaya de Jijel, 2017).

### **3.3 Housing policy and housing situation in Algeria.**

This section aims to present the history of housing policy and housing situation in Algeria through a research process by finding, gathering the data and analysing them in comparisons and not just reporting numbers.

Algeria was colonised by the French in 1830 for more than a century (1830-1962). Until its independence, the country remained the most important and problematic of all French territories (Çelik, 1997).

The French colonisation in Algeria proceeded in three main phases that were different in time and space:

- The conquest, from 1827 to 1916: this period was concretised by the spread of military buildings in cities in order to shelter armed forces.
- Safety, stability and settlement, after 1916 and before 1954: this phase was characterised by the creation of new European neighbourhoods as well as cutting through pre-colonial Arab medina and the widening of its roads. These urban actions were created in response to military orders.
- Repression: before and during the war of liberation (before 1945 and 1962). This period witnessed civil constructions of the 19<sup>th</sup> century and those of the beginning of the 20<sup>th</sup> century that met the need of civil population using military engineering (Boufenara, 2006).

The French were concentrated in the Northern part of the country as they focused on agricultural exploitation of the best lands along the Mediterranean coast. This resulted in an imbalanced development of the country since the northern region was the only part that had the necessary infrastructure for any immediate development. After the independence in 1962, the Algerian Government undertook the first economic development plans in the north aggravating the already existing unequal growth and exacerbating the rural exodus of the population which created a real housing crisis (Behloul, 1991).

Unfortunately, the Algerian Government, in its first development plans (1967-1969) and (1970-1973) and in order to acquire the economic independence, gave priority to industrial investments and concentrated on heavy industries (such as the hydrocarbon and steel industries) at the expense of other social sectors (Barkat, 2006). On the other hand, under the policy of the agricultural revolution the second development plan focused on rural housing (Tarache, 2009). The government programmed the construction of 1000 socialist villages however the construction of only 333 (33.33%) villages took place and the construction of 58,542 rural dwellings has been achieved (Benmatti, 1982).



**Figure 3.3: An old photo of the socialist village (Belghimouz) in Jijel (Source: Province of Jijel).**

In addition to the neglect of urban housing, the natural growth of the urban population and the rural exodus had aggravated the housing crisis. It was not until the end of the third national development plan (1974-1977) and the beginning of the fourth plan (1980-1984) that the state showed concerns about the problem. The Algerian Government, taking the experience of Europe as model, launched a considerable prefabricated building programme, which consisted of housing and community buildings. However, this programme failed to reach the desired objectives due to the low annual achievements that remained below the demand. Interestingly, the use of the imported architectural styles and urban forms also did not meet the needs of local population (Barkat, 2006).

\*The following two years of 1978 and 1979 were not included in any development plan (Benmatti, 1982).

The housing sector was growing without any control until 1977 when the Algerian Government created the "Ministry of Urban Planning, Construction and Housing" (MUCH), the first political structure which was responsible for implementing a housing policy and the development of urban planning (Behloul, 1991).

During the first three national development plans the desired objectives were less than needed with insufficient housings production: only 173 143 dwellings were constructed when the government planned the construction of 218 344 dwellings between 1967 and 1977 (Benmatti, 1982).

In 1979, the government with the aid of a Polish team estimated the short and the long-term needs for the country's housing and two targets were set; the short term target was to attain the production of 100,000 urban dwellings per year between 1980 and 1985, and the longer term goal was to reach the production of 200,000 urban dwellings per year by 1990. However, the desired targets have never been reached as the annual production attained only 88,000 dwellings. This was not only the result of the poor productivity of the building sector and its long delays, but the bad economic conditions of the country during this period as the national economy was largely influenced by the sudden fluctuations in the oil market (Daara, 2009).

Consequently, the government in its five years development plan (1980-1984) encouraged the involvement of the private sector in the construction of housing in order to gain other sources of financing so that only 40% of housing production would be financed by the state.

The Algerian government had introduced other measures in order to reduce the costs of the mass housing construction programme. The first alternative was introduced in 1987 and it involved delivering the houses to their beneficiaries in unfinished conditions. Then, it was the beneficiary's responsibility to finish the work and the cost was deducted from the amount of the house's rent. This scheme was very unpopular and had not been applied to the extent to which it was planned because of the shortage of building materials and the high prices of the finishing work (Benmatti, 1982). The second alternative was to give the opportunity to the renting occupants of the dwellings to buy their houses at very reasonable prices and paying the cost by monthly installments

instead of rent. This alternative aimed to reduce the pressure on the public expense with regard to the management and the maintenance of the dwellings (Barkat, 2006).

After the year 1986, the country witnessed a financial, political and security crisis which created an imbalance between the capacity of production in the housing sector, the availability of financial resources and the planned housing programmes. In addition, price liberalisation allowed suppliers to raise prices of construction materials which discouraged investors from the private sector to invest in the building sector. This consequently aggravated the housing crisis and caused deterioration of the built environment (Behloul, 1991).

The political crisis and civil war witnessed in the country between 1990 and 2000, also known as the dark decade, led to a steady flow of rural-urban migration and an uncontrolled rise in urban population due to the insecurity and the lack of basic services in rural areas.

The 1998 census estimated the number of occupied houses to be 3.5 million units of which 400,000 (11.42%) units were slums. Interestingly, around 2 million houses were constructed before 1962; 850,000 dwellings were constructed before 1945, 50,000 dwellings were constructed between 1945 and 1954 which leaves 148,000 dwellings between 1954 and 1962 (Daara, 2009).

The dwelling occupancy rate (TOL) was 7.11 persons per house in 1998 which indicated a deficit of 800,000 houses in comparison with 1966 when the TOL was 6 persons per house. The bloody decade of 1990's did not only affect the housing sector but it also stagnated the entire economy of the country. It was not until 1999 that the Algerian economy slowly regained a semblance of activity. The five-year economic recovery plan (2000-2004) aimed exclusively to solve social problems with particular emphasis on housing sector, in an attempt to revive economic growth (Tarache, 2009). The national housing policy adopted in this period aimed to improve living conditions for all social groups across the Algerian territory with special emphasis on low income groups, in order to achieve better space occupancy as well as to slow down rural exodus (Bellal, 2009). Table 3.2 shows housing supply in Algeria between 1999 and 2004.

Year	1999	2000	2001	2002	2003	2004
Number of housing	124,208	130,072	101,962	104,275	74,071	81,175

**Table 3.2: Housing supply per year-without self-build houses between 1999-2004 (Bellal, 2009).**

In the five year plan (2000-2004), the government adopted a new housing policy in order to diversify housing types according to households' incomes. Consequently, new housing types were established in order to meet the needs of intermediate income households who were not allowed to benefit from the social rental houses designated to low income households and could not afford to buy the expensive promotional (luxurious) houses. During this period, the government achieved the delivery of 810,000 dwellings. This achievement had an important positive impact on the serious housing shortage and reduced the dwelling occupancy rate (TOL) from 7 persons to 5.5 persons per house between 1999 and 2004. However, the delivery of houses was slow and the prices remained expensive (Tarache, 2009).

The following five year development plan of (2005-2009) aimed to deliver over 1 million dwellings and the government has committed more than 18 billion Dollars to finance housing and urban planning sectors. The programme contained housing development and social housing designated for low income households, while intermediate income households benefited from a governmental financial aid in addition to a reduced interest bank-loan. Approximately 40% of the programme was targeted to rural areas in order to encourage an urban-rural flow of population. In fact, the programme was divided as follows:

- 22% of the programme is Rented social housing.

- 23% Participatory social housing (LSP).
- 38% Rural housing.
- 10% Rent to sell housing.
- 5% Promotional or luxurious housing (Tarache, 2009).

Unfortunately, by the end of the five years plan (in 2009), only 27.15 % of the programme has been implemented, 43.95% were under construction and the rest were programmed to be launched in the future (Bellal, 2009).

In the following five years plan (2010-2014), the government introduced some changes in housing types in order to satisfy the needs of middle class families. The main changes affected the size of the houses by a small increase in the average size of flats from 68 sqm in LSP houses to 70 sqm in Assisted Promotional houses (LPA) which replaced LSP. This initiative aimed to afford more spatial comfort for future residents.

The Minister of Housing and Urbanism stated that over 2.2 million houses from all categories had to be delivered before the end of 2014 (El Khabar, 2013). Table 3.3 shows that by the end of 2012, a total number of 602,717 houses that remained unfinished from the previous development plan have been constructed and delivered to their beneficiaries.

Housing types	2010	2011	2012	Total
Rented social housing	61, 316	74, 317	66, 259	201, 892
Participatory social housing	28, 889	28, 114	24, 732	81, 735
Rent to sell	7, 777	6, 816	2, 422	17, 015
Promotional housing	4, 891	6, 061	5, 454	16, 406
Self-Build	11, 761	30, 836	14, 750	57, 347
Total urban	114, 634	146, 144	113, 617	374, 395
Rural housing	76, 239	66, 521	85, 562	228, 322
Total	190, 873	212, 665	199, 179	602, 717

**Table 3.3: Housing delivery between 2010 and 2012.**  
(Source: MHUV, 2013).

However, after three years of that five years plan the new programme designated for intermediate households had not been produced due to the slowness of the administrative procedures.

### **3.4 Present housing situation in the city of Jijel.**

This part of the chapter researches the present situation of housing in the city of Jijel. The personnel expertise of the researcher as an architect in the housing department had helped to have a deep understanding of the housing sector and its problems. Also, it allowed multitude conversations with other professionals in the domain to take place. The views developed in this section are derived from personal observation which is a considerable part of this research.

The national housing policy adopted by the Algerian government aimed to improve living conditions for all social groups across the Algerian territory with special emphasis on low income groups in order to achieve better space occupancy and slow down rural exodus.

In its new revised five years housing programmes of (2010-2014) and (2015-2019), the Algerian government intends to deliver a total of one million new houses. In this context, the Algerian ministry of housing, urbanism and the city has set the following guidelines into the national planning policy:

- Revise and finalise Land use, development and planning strategies.
- Identify the areas threatened by natural disasters (floods and earthquakes) and prohibit any public or private construction there.

- Initiate an important programme of rehabilitation or gradual replacement of old houses that were exposed to important damage in raining areas.
- Eliminate the phenomenon of slum towns through a radical operation that gives priority to house the occupiers of slums and take effective measures to prevent the construction of any other precarious houses.
- Prioritise unfinished housing projects and ensure compliance with urban standards and adherence to the new legislations.
- Accelerate the rehabilitation of old buildings, and if necessary their deconstruction and replacement as well as provision of financial help to the occupiers.
- Continue the construction of public rented houses for citizens with low incomes (MHUV, 2012).

Housing policy in Algeria was adopted in order to diversify housing types according to households' incomes and living conditions. The government in its five years plan of (2010-2014) aimed to build a programme of one million social houses. This plan consists of the following types:

### 3.4.1 Public Rented Housing: LPL (Logement Public Locatif).

Public rented houses are entirely financed by the government. This type of houses is designated to low income households living in very bad conditions or those who don't own a suitable house. The following are the exclusion criteria for eligibility for LPL houses:

- People who already own a house, a plot or a piece of land.
- People who had already benefited from any kind of public houses.
- Had benefited from a governmental financial aid to buy, build a house or arrangement of a rural house (MHUV, 2012).

These criteria are applicable for both the applicant and its spouse. According to the ministry of housing and urbanism, the LPL house is a three rooms unit (2 bedrooms and a living room) where the total living area is fixed by 67 m<sup>2</sup> plus or minus 3%. Table 3.4 presents the detailed surfaces of the different interior spaces of LPL house as determined by the ministry.

Space	Area (m <sup>2</sup> )
Living room	20
Room 1	11
Room 2	13
Kitchen	10
Bathroom	3.5
Toilet	1.5
Circulation	7 (12% from the total living area)
Arrangement	1
Living area	67 ± 3 %
Balcony Logia	5
The total area	72 ± 3 %

**Table 3.4: Areas of different spaces in LPL house. (Source: technical guide of LPL houses).**

The block of four apartments by floor is preferred in social architectural projects because of its economic value: lower construction prices and smaller scale area needed for the building.

The distribution of LPL houses is managed by administrative committees where local authorities and non-governmental organizations are represented. The procedure seems to be a great deal with housing shortage. However, the bureaucracies and injustice in the administrative system in Algeria (as well as in many other developing countries) led to an unfair delivery of these houses. Consequently, the government objectives in overcoming housing shortage will be very hard to achieve.

The wilaya of Jijel had benefited from a total number of 16981 units of social rented housing since 2005 (Housing department, 2016). Table 3.5 shows the details of housing situation in the five year program (2010-2014) until 31/12/2014. Only 24.7% of the program has been delivered, 4376 (50.88%) dwellings were under construction since 2011 also 2100 (24.41%) houses were to be launched.

Year	Planned	Delivered	Rate (%)	Under construction	Rate (%)	To be launched	Rate (%)
2010	1, 500	1, 093	72.86%	407	27.14	0	0
2011	1, 500	359	23.93%	1, 141	76.07%	0	0
2011 complementary 1	1, 500	389	25.93%	1, 111	74.07%	0	0
2011 complementary 2	2, 000	283	14.15%	1, 717	85.85%		
2012	-	-	-	-	-	-	-
2013	2, 000	0	0	0	0	2, 000	100%
2014	100	0	0	0	0	100	100%
Total	8600	2124	24.69%	4376	50.88%	2100	24.41%

**Table 3.5: LPL housing situation in Jijel during the five year programme (2010-2014) until 31/12/2014 (Source: Housing department, Jijel).**

Table 3.6 also shows that until 31<sup>th</sup> December 2016, 71.66% of the programme had been constructed, 27.74% of the houses were under construction and just 0.6% not yet started. However, three years after the end of the five year programme (2010-2014) 46% of houses were still under construction.

Programme	Planned	Delivered	Rate (%)	Under construction	Rate (%)	To be launched	Rate (%)
Before 2005	1081	1081	100%	-	-	-	-
2005-2009	7300	6570	90%	730	10%	-	-
2010-2014	8600	4518	52%	3982	46%	100	2%
Total	16981	12169	71.66%	4712	27.74%	100	0.6%

**Table 3.6: LPL housing programme in Jijel until 31/12/2016 (Source: Housing department, Jijel).**

In the last five year plan (2010-2014), the province of Jijel has benefited from 8600 units of LPL houses. However, the total number of required dwellings until 31/12/2016 was estimated to be 40,972 (Housing department, 2016) which exceeds by five times the five year programme and more than nine times the delivered programme. This shows clearly that the demand for this type of housing is much higher than the offer.

### **3.4.2 Assisted Promotional housing: LPA (Logement Promotional Aide).**

This type of houses is managed by both public and private real estate developers. It replaces the old Participatory Social Housing (LSP) scheme of the previous five years plan

of (2005-2009). It was designated to support households with intermediate incomes who are eligible for governmental non-refundable financial aid. The exclusion criteria of the eligibility for LPA housing are similar to those for LPL houses.

Government financial aid provided for the acquisition of a LPA house was fixed as below:

- 700,000 Da (Algerian Dinars) when household's monthly income is more than the national minimum salary (equivalent to 15,000 Da) and inferior or equal to four times of the national minimum salary. In fact, the aid is very generous as it covers more than 25 % of the total cost of the house which is predetermined to equal or less than 2,800,000 Da.
- 400,000 Da when household's monthly income is four times higher than the national minimum salary and less than or equal to six times the national minimum salary (MHUV, 2012).

The funds for these projects are not only raised from the national budget but banks and potential beneficiaries also participate. The funds are divided as follows: 30% of the fund is provided form beneficiary; 26.85% from the national treasury and the rest (43.15%) is from a bank credit. In addition, the beneficiary can also gain from a reduced bank credit loan of only 1% interest provided by the public treasury (MHUV, 2012).

The total living area is fixed at 70 m<sup>2</sup> plus or minus 3%.

Promotional assisted housing must include a lounge with an area of approximately 18 m<sup>2</sup> and two rooms each with an area of about 12 to 14 m<sup>2</sup>, a kitchen of about 10 m<sup>2</sup>, a bathroom of 4 m<sup>2</sup> and a toilet of 1.5 m<sup>2</sup>.

Table 3.7 below presents the areas of the different interior rooms of the house as determined by the Ministry of Housing, Urbanism and the City.

Space	Area (m <sup>2</sup> )
Living room	18
Room 1	14
Room 2	12
Kitchen	10
Bathroom	04
Toilet	1,5
Hall	7 (12% of the total living area)
Arrangement	1
Living area	70 ± 3 %
Balcony Drying area	5

**Table 3.7: Area of interior units of the LPA apartment.  
(Source: MHUV, 2012).**

Developers will be required to take into account people with disabilities by creating spaces designed especially for them at the entrance level of buildings.

The province of Jijel had benefited from 3624 units of LPA houses in the five year plan 2010-2014. Table 3.8 shows LPA housing situation until 31/12/2014, just 1020 (28.15%) dwellings of the programme were under construction and 2604 (71.85%) houses were to be launched from 2013. Also, there were no implemented completions in this programme.

Programme	Planned	Constructed	Rate (%)	Under construction	Rate (%)	To be launched	Rate (%)
2010	1000	0	0	290	36.8%	710	61%
2011	1624	0	0	460	63.5%	1164	36.94%
2013	1000	0	0	270	35%	730	65%
Total	3624	0	0%	1020	28.15%	2604	71.85%

**Table 3.8: LPA housing programme in Jijel until 31/12/2014**  
(Source: Housing department, Jijel).

Table 3.9 shows that until the 31 December 2016, only 0.6% of the total programme was implemented, 48.07% of the houses were under construction and more than half the programme (51.33%) was not yet started.

Programme	Planned	Constructed	Rate (%)	Under construction	Rate (%)	To be launched	Rate (%)
2010	1000	22	2.2%	368	36.8%	610	61%
2011	1624	0	0	1024	63.5%	600	36.94%
2013	1000	0	0	350	35%	650	65%
Total	3624	22	0.6%	1742	48.07%	1860	51.33%

**Table 3.9: LPA housing programme in Jijel until 31/12/2016**  
(Source: Housing department, Jijel).

### 3.4.3 Social Participatory Housing: LSP (Logement Social Participatif).

The programme of Social Participatory housing in Jijel consisted of 3103 housing units. Table 3.10 shows that until the 31 of December 2016, 10.44% from the five year plan (2005-2009) were still under construction.

Programme	Planned	Constructed	Rate (%)	Under construction	Rate (%)	To be launched	Rate (%)
Before 2005	133	133	100%	0	0	0	0
2005-2009	2970	2660	89.56%	310	10.44%	0	0
Total	3103	2793	90%	310	10%	0	0

**Table 3.10: LSP housing programme in Jijel until 31/12/2016**  
(Source: Based on data from Housing department, Jijel).

The total number of requests for LPA and LSP houses until the 31<sup>th</sup> of December 2016 was more than 14,700 (Housing department, 2016) which exceeds double the cumulative (planned) programme of 6727 and more than five times the constructed programme. Once again it is clear that the demand for this type of housing is much higher than the offer.

### 3.4.4 Rent to Sell housing: LV (Location-Vente).

Rent to Sell housing is a form of acquisition of housing after a predetermined period of rent fixed by a maximum of 20 years. The beneficiaries have to pay an amount of 25% of the total price of the house in three instalments. The rest of the price is to be paid as a monthly rent. The exclusion criteria for eligibility for LV housing are similar to those for LPL and LPA houses. In fact, the households' income should be greater than the national minimum salary (equivalent to 18,000 Da) and less than or equal to five times the national minimum salary.

Until the end of 2016, the province of Jijel had benefited from 3600 units of LV houses from 2002.

Table 3.11 shows LV housing situation until 31/12/2016. The constructed programme represented just 5.55% of the total planned programme with only 200 units delivered;

65% of the programme was still under construction and 27.77 % of houses were to be launched.

Programme	Planned	Construct ed	Rate (%)	Under construction	Rat e (%)	To be launched	Rate (%)
Before 2005	200	200	100%	0	0	0	0
2005-2009	400	60	0	340	85%	0	0
2010-2014	2300	0	0	2000	86.95%	300	13.05%
2015-2019	700	0	0	0	0	700	700
Total	3600	260	5.55%	2340	65%	2604	27.77%

**Table 3.11: LV housing programme in Jijel until 31/12/2016**  
(Source: Housing department, Jijel).

At the end of 2014, none of the programme for 2010-2014 had been started. The demand for LV housing was assessed as 7074 in Jijel (Housing department, 2016) which is double of the planned programme. 6877 of those requesting such a house have already paid the first instalment which represents 10% of the total price. Unfortunately for the people who have already paid the first installments, they are not allowed to apply for any other governmental aids such as social housing or any other type of assisted public housing, because they are already registered as beneficiaries in the national file of the ministry of housing (Housing department, 2016). Figure 3.4 shows the project of 400 LV houses in Mezghitane, Jijel from the five year plan 2005-2009 of which only a small number have been completed.



**Figure 3.4: The project of 400 LV houses in Mezghitane, Jijel**  
(December, 2016).

### 3.4.5 Public Promotional Housing: LPP (Logement Promotionnel Public).

Public Promotional Housing (LPP) is a new form of housing assisted by the state. This form was first introduced in the country by the executive decree of 27<sup>th</sup> of July 2014. It is

designated for households that have a total monthly income superior than six times the national minimum salary and less than 12 times the national minimum salary. The estimation of the housing price is based on the total cost of construction including the price of land as well as the profit margin of the developer.

The state support of these projects is represented in a reduction in the interest rates for bank loans and reduction in the prices of land designated for the construction of these projects which affect the price of houses

The province of Jijel benefited from a total allocation of 1000 units of LPP houses; however only 28% (280 houses) of the programme is under construction in the municipality. The construction of the project started in 2015 and it is in its first stages as shown in Figure 3.5.



**Figure 3.5: The project of 280 LPP houses in Jijel (January 2016).**

The rest of the programme is divided into 3 other municipalities in Jijel and the three projects have not yet been started.

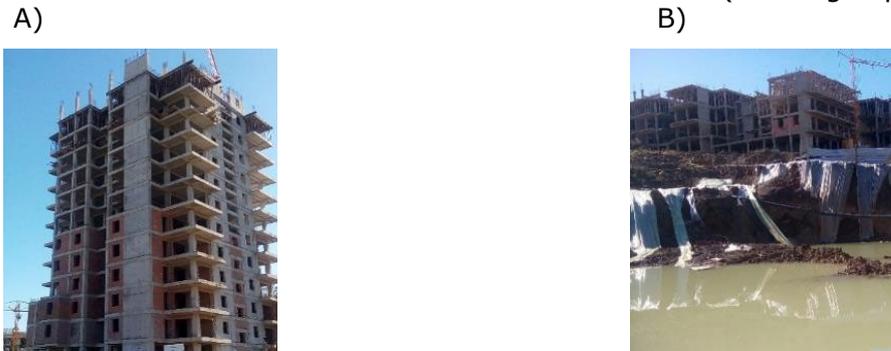
The number of application forms for the acquisition of an LPL house that have been taken is 1135, however, just 633 full applications were submitted and only 426 demand requests were accepted (ENPI Jijel, 2016). This is probably due to the estimated final price of the house which is still very high despite the state aid in addition to the poor location of sites in some municipalities such as Jijel and El Milia. The last of these received just 36 application forms where the programme designated to this municipality was 250 units. On the other hand, for approximately the same price the applicant can buy a private promotional house (luxurious) in a much better location.

### **3.4.6 Promotional (Luxurious) houses.**

The Algerian government introduced other sorts of houses for a large category of households excluded from social housing. Promotional (Luxurious) houses were created in 1986 (Bellal, 2009). They are intended for households or individuals who are not eligible for any type of governmental financial aid. They can be in the form of collective apartments, duplexes or even individual houses. These projects are managed by both public and private real estate developers. There are no official norms or regulations applied to promotional houses; only, measures of comfort, aesthetics and profitability of the project are taken into account.

During the five years plan 2010-2014, the province of Jijel benefited from an allocated programme of 590 promotional apartments in the East Entry of the city in the form of towers. This programme was assigned to seven developers: one public and six others private. These developers had benefited from the provision of land with a reduction in price within CALPIREF (The Province Committee of Support to Location and Promotion of Investment and Regulation of Land) (Housing department, 2016).

Since 2015 the work on site has been started in the majority of projects, however, the progress rate of most projects is very low. Figure 3.6 shows the highest rate marked in December 2016 were 47.5% and the lowest rate was 3.5% (Housing department, 2016).



**Figure 3.6: the progress rate of work in the project of 590 promotional houses: A) the highest rate 47.5% & B) the lowest rate 3.5%.**

### 3.4.7 Rural housing.

This programme was developed to support the policy of rural development. It aims at promoting rural spaces and encouraging individuals to settle in their original rural areas instead of moving into overpopulated cities. The policy of rural housing consists to ameliorate rural dwellings conditions and encourage households to self-build dwelling that can be integrated in its environment. The followings are the criteria for eligibility to a grant to build a rural house:

- People who have not benefited from any kind of public housing.
- People who have not benefited from a financial aid from the government to buy or build a house.
- When households' monthly income is less than or equal to six times of the national minimum salary.
- People who already own a piece of land in a rural area.

The city of Jijel has benefited from the allocation of financial aid for 25,020 units in the last two decades (1996-2016).

Table 3.12 shows that only 1.27% of the programme was not yet started by 31/12/2016, 90.94% were constructed and 7.78% were still under construction.

Programme	Planned	Constructed	Under construction	Not yet started
PEC (Before 2005)	5,716	5,605	111	0
2005-2009	7,304	7,209	95	0
2010-2014	11,000	9,755	1085	160
2015-2019	1000	186	657	157
Total	25,020	22,755	1,948	317

**Table 3.12: Rural housing programme in Jijel until 31/12/2016. (Source: Housing department, Jijel).**

To be noted: the completion of the aid does not mean the completion of the house. Many alternatives had been undertaken by the ministry of housing, urbanism and the city in order to help people to construct their houses. In the first five years plans and before 2015, the grant was given to the beneficiary into three or two installments depending on the programme but after the completion of the work. The last installment was paid after the completion of the house. Figure 3.7 shows the different steps of the completion of a rural aid from the 2011 programme (The house was completed in 2013).



- Application for first installment.



- Application for second installment.



- Application for the last installment.

**Figure 3.7: Example of a rural house in the municipality of Oudjana finished in 2013 (Source: Housing department).**

However, since 2015 the ministerial note N°178 of 25<sup>th</sup> of February 2015 had set that the beneficiary can have the first installment before the construction work started. Also, they can have the second installment after the completion of just the structure (Post and concrete slab).

Another ministerial note N° 962 of 13<sup>th</sup> of November 2016 had set that the beneficiary could have the second installment after just the completion of posts and the foundations. These procedures aimed to facilitate the achievement of house completions, however, it resulted in many concrete frames scattered in rural areas. Figure 3.8 shows houses constructed by state grant in 2016.



**Figure 3.8: Completed work for the application of the second instalment, December 2016 (Source: Housing department)**

### **3.4.8 Rehabilitation.**

The province of Jijel had benefited from 2000 aid packages for rehabilitation of old houses both collective and individual in 2012. The programme is divided as follows: 67.75% (1355) are designated for individual houses, the rest of the programme (645) is designated for collective apartments.

By 31<sup>th</sup> of December, less than a third (32.25%) for individual housing had been started. Also, just 40% of the programme designated for collective apartments had been launched (Housing department, 2016). This delay in the management of the programme is due to the slowness of municipalities in the preparation and validation of beneficiaries lists.

### **3.5 Obstacles in housing sector.**

Despite the seemingly considerable efforts displayed in the domain of habitat, the objectives set by the Algerian government have not been achieved on both quantitative and qualitative levels this lead to a serious imbalance between demand and offer. Also, many obstacles and problems are facing the housing sector.

According to the author's experience as a practitioner architect in the Housing Department of Jijel and other evidence presented in this chapter, the housing sector in Algeria with special emphasis on the province of Jijel is facing many obstacles:

#### **3.5.1 Obstacles facing urban housing programmes.**

In general, the different urban governmental programmes in Algeria sited above are facing the same obstacles and difficulties, which are:

- The modification in the Land Use Plans under revision which negatively affect the projects plots especially in their limits.
- The access to some new sites is very difficult.
- The administrative procedures for the delivery of the acts of property of lands are considered very slow.
- Very rugged morphology of some sites.

- The presence of physical constraints in some sites such as: Illegal constructions, medium voltage electricity lines, and sewage systems.
- Failure of some private developers to manage the programme.
- Opposition of citizens claiming ownership of land plots designated for public housing projects which leads to the intervention of public force in order to implant the programme.
- Withdrawal of some developers in many projects which caused a considerable delay to the designation of a new developer.
- The inefficiency of developers which affects the quality of construction and delays the period of completion.

### **3.5.2 Obstacles facing rural housing programmes.**

- Bad choice of land plots by some beneficiaries (rugged and sometimes inaccessible terrain) which resulted in additional costs and the beneficiary being unable to complete the construction of the house.
- Lack of craft and trades in rural areas affects the deadline for completion of the house.
- The distance of building materials depots from rural areas which increases the price of transport of the materials and this in turn will increase the price of construction. In addition to the perturbations and increases in the price of cement and steel in the market.
- Delay in the preparation of beneficiaries lists by some municipalities.
- The delay in the implementation of some aid packages in some municipalities.

In conclusion, the major problem in Algeria is not only the quantity of houses produced, but by whom and for whom housing is produced and how it is distributed (Deniz, Peltier, Buckley, Brular, & Larbi, 2008). Also, the inability of citizens to benefit from government assisted houses due to households' low incomes and sometimes unemployment. In fact, there is a big gap between salaries and housing prices. The ratio between the price of a house and the average annual income of a middle-income family is 9:1, which means that the family has to save her annual income for nine years in order to be able to afford an LPA house (Bellal, 2009). The government in the new programme has introduced a supported loan with just 1% interest; however, many people would not take loans with interest due to religious reasons. Therefore, unless lessons from failure of previous policies are learned and new effective measures to combat the above problems are taken by the government, the housing policy in Algeria is likely to fail again in ensuring adequate housing for its citizens and obtaining any level of urban sustainability.

### **3.6 Conclusion.**

This chapter has investigated housing situation in Algeria through both historical and policy contexts. This chapter aimed to research the different problems facing housing sector in order to better clarify to the obstacles that impede the integration of sustainability parameter in Algeria particularly in this sector. This chapter is an important part of the research project as it is not just a review but research as it brings together

and compare information and data in this way for the first time at least for this location (Jijel).

According to what was presented in this chapter, it can be concluded that housing policy in Algeria fails to respond to both quantitative and qualitative needs of its local population. In fact, many problems are facing the housing sector and the most important issue is the serious imbalance between housing demand and the offer. Unfortunately, a significant increase in the number of houses produced is not possible, particularly after the economic crisis declared in the country in 2015 caused by the sharp decrease of oil prices. Also, the slowness of administrative procedures in most cases is one of the important causes that delay the completion and then the delivery of new projects. In order to reduce the cost of projects the government can make better use of local workers, developers and professionals rather than importing them from overseas, an example is the Rent to sell house projects in Jijel with 2000 houses under construction using an international company that has used more than 200 foreign workers. The government could train local workers and professionals and this will reduce the rate of unemployment and will probably reduce the cost of houses. In addition, the government could integrate the new technologies and techniques in all fields of work in order to speed the administrative procedures in all stages of projects: choice of land plot, design, and construction in order to deliver the houses in their deadlines.

Therefore, unless lessons from failure of previous policies are learned and new effective measures to combat the above problems are taken by the government, the housing policy in Algeria is likely to fail again in ensuring adequate housing for its citizens and obtaining any level of urban sustainability.

The next chapter 4 will investigate sustainability aspects of traditional houses in Algeria in order to outline the different aspects and features of traditional houses that are suitable for the planning of new sustainable settlements with special emphasis on courtyard houses in the medina of Constantine.

## **Chapter 4: Study of Sustainability Aspects of Different Typologies of Traditional Houses in Algeria.**

## **4.1 Introduction.**

Vernacular and traditional buildings worldwide are the result of experience and practice of many centuries and can represent a permanent source of knowledge (Oikonomou & Bougiatioti, 2011).

Vernacular houses could be considered as the evidence of knowledge of the master-builders who built it. Traditional building cultures respond to the landscape through the use of available local materials, the harmonisation with the local environment and climate, showing man's capability to be accustomed to a place, to afford his needs and to deal with the social and cultural identity of territories. Building a house was a collective activity that expresses collective needs and values as the houses were generally built by their residents with specialised master-builders and some members of the community. Sustainable features in traditional architecture were not considered as a concept at the time of its creation, but were a spontaneous and instinctive action (Tomovska & Radivojevic, 2017).

Vernacular architecture in Algeria is rich in many aspects: historical value, identity, and the range of architectural solutions used to respond to environmental problems (Sabrina, 2013). This chapter aims to investigate the different typologies of traditional houses and urban planning in Algeria with an emphasis on the aspects of sustainability. It explains the choice of the study of courtyard houses in Constantine.

The main objective of the chapter is to outline the different aspects and features of traditional houses that are suitable for the planning of new sustainable settlements with special emphasis on courtyard houses in the medina of Constantine. It highlights the main characteristics of the Kabylia house, the Soufi house, the Zeriba of Hoggar. The chapter then analyses the courtyard houses of Constantine in more details. It describes the main features of the urban fabric of the old medina: ramparts and doors, streets and centre. Finally, the chapter studies the main features of courtyard houses in the medina and the principal role of the courtyard.

This chapter strive to explain the basis on the foundation of the second hypothesis for this research: "Traditional settlements are more suitable for the local population than modern residential group schemes".

## **4.2 Different typologies of traditional houses in Algeria.**

Traditional houses in Algeria according to Benmatti can be divided into three categories:

- The first category grouped the courtyard houses in the towns of the North (Medinas) with specific emphasis on the medina of Constantine.
- The second type is less homogeneous than the first category and includes houses of rural and semi-urban areas of the North; the research focuses on the example of Kabylia.
- The third category concerned housing settlements in the South. The study investigates the examples of M'zab, Souf and Hoggar (Benmatti, 1982).

These are described in the following sections. Figure 4.1 shows the location of these traditional houses.



**Figure 4.1: Location of the studied traditional houses in Algeria.**

### **4.2.1 The Kabylia House.**

The Kabylia Berber villages are situated on the summit and slopes of mountains or in high plateaus where the population are living from land exploitation in small dense groupings (Benmatti, 1982). The topography and climate are the factors that determine spatial structure of the village, streets and alleys which follow the geographic configuration of the site. Figure 4.2 shows a birds-eye view of a Kabylia village situated in a summit of a mountain. The urban fabric is delimited by a circular road around the summit and the houses or 'Axxam' are organised along radiant or alleys that are perpendicular to the circular road. The dwellings are often grouped and linked to each other to form the big family house.



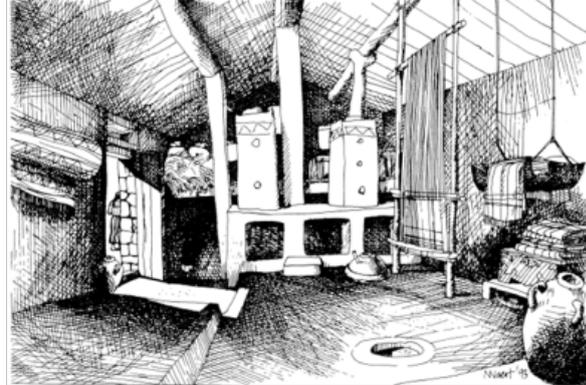
**Figure 4.2: Village in the mountains of kabylia (Institut francais de cartographie, 1960).**

The big house shelters the whole family, the groups of dwellings is extended by the construction of new houses in the courtyards of a parents' house which is extended over two or three generations and forms a sub-quarter called *Thaxxarubth* which occupies a defined space (Toubal & Dahli).

The house is classified as an 'elementary house' which has grouped under a roof: one family, its animals, its farming implements and products (Maunier, 1926). Humans and animals are juxtaposed without any vertical or horizontal separation. The house is grouped into three different spaces: a high living room for people with a fireplace, a low stable for animals and water jugs, and a shed for implements and crops. The room is designated for both male and female use as men pass the whole day outside working on the land and they

just come to the house to eat and sleep. The relation between public and private is not determined in the plan as the total house is considered as a private place (Loeckx, 1998).

In the vast majority of Kabylie houses, the humid parts of houses are designated for activities related to water such as Kitchen and bathrooms. The 'Kanun' which is the traditional oven occupied the driest place (Loeckx, 1998).



**Figure 4.3: Interior view of the Kabylie house (Loeckx, 1998).**

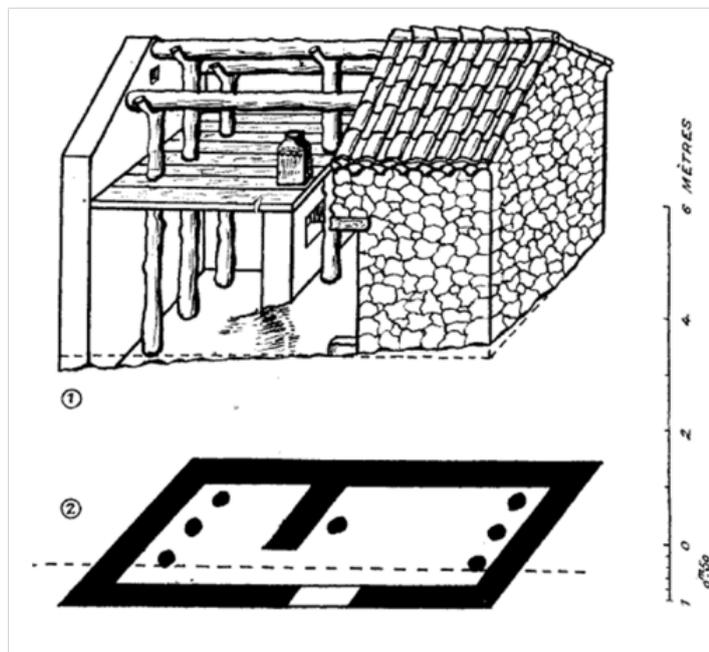
The courtyard in the Kabylie house is located in the exterior of the house where some summer traditional activities such as pottery are unrolled.

The house has a rectangular form and the dimensions are on average:

- Exterior length varies from 7 to 7,5 m.
- Exterior width: 5 m.
- The height of walls: varies from 3 to 3.5 m.

These dimensions can vary depends on the family's needs and financial situation of households.

The external walls of dwellings are thick and normally without windows which permits the protection of the interior house from cold in winter and heat in summer; the only opening is the door. Also, the walls are constructed from local stones and the roofs have two slopes and generally made by roman tile or clay. The frame is based on wooden Ash beams then on olive branches supported by its low side walls (Maunier, 1926).



**Figure 4.4: 3D view and plan of a Kabylie house (Maunier, 1926).**

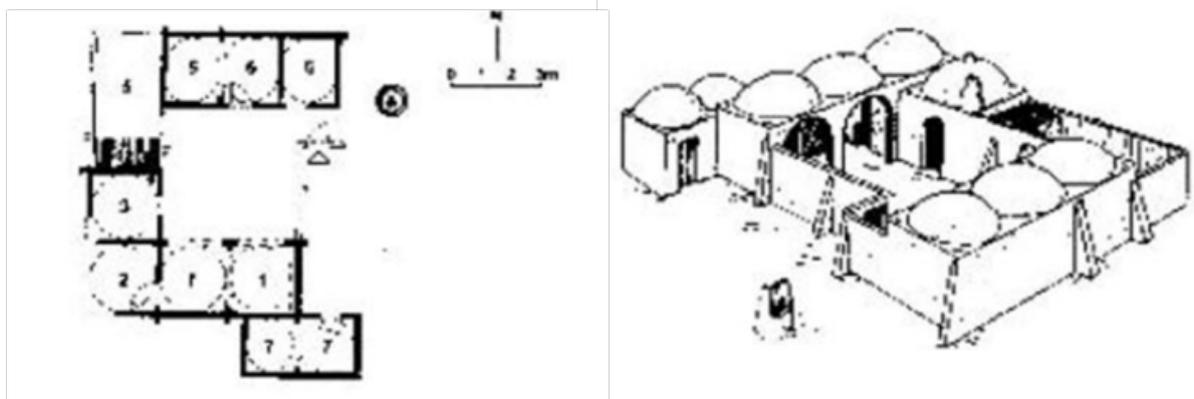
#### 4.2.2 Courtyard houses of Oued Souf (Soufi house).

The Soufis or the inhabitants of Oued Souf are originally from Yemen; looking for water and better climatic living conditions; they crossed Egypt and Tunisia to settle in Oued Souf a city in the Algerian Sahara in the borders with Tunisia and Libya. The city is 620 km south east of the capital Algiers (Benmatti, 1982). The city is famous for its oriental Grand Erg (which is the largest erg or "field of sand dunes" in the Sahara Desert in Algeria). It covers the 2/3 of the total area. Oued Souf is known as "city of a thousand and one domes" for its particular architecture characterised by the uniformity of styles: the use of cupola, domes and vaults. The old city is situated in the city centre and surrounded by three main roads, which separate the traditional urban fabric from the new town. The old city has a traditional architecture. The plan of the old city shows a compacted urban structure which is characterised by a dense network of narrow twisting alleys, differences in width and direction provide shaded movement between neighbourhoods (Bourbia & Awbi, 2004).



**Figure 4.5: Compact urban fabric of the old city of Oued-Souf (Bourbia & Awbi, 2004).**

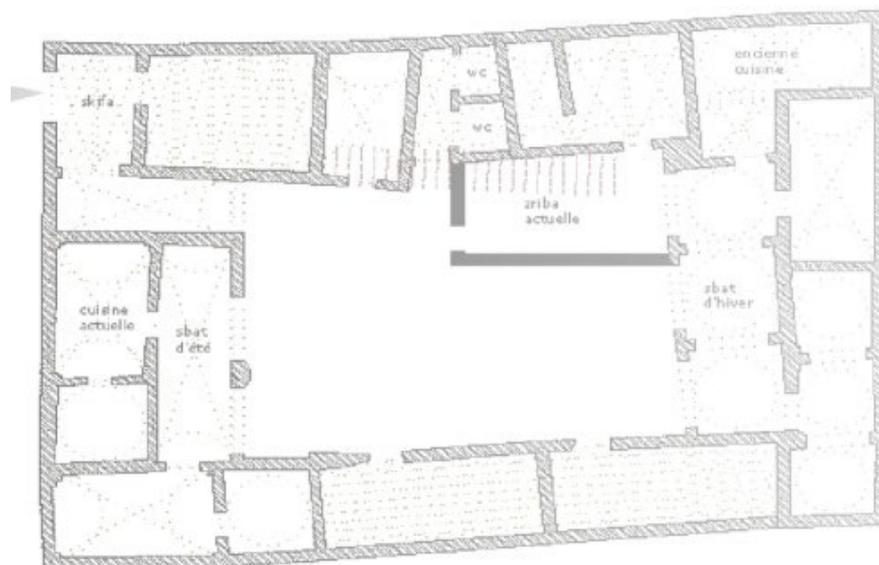
The houses are arranged around a central courtyard covered by palms branches. They are constructed by locally available materials particularly the desert rose, stones and plaster.



**Figure 4.6: Schematic plan and perspective of a traditional house in Oued Souf (Fezzai, Ahriz, & Alkama, 2012).**

The original traditional house of Oued Souf is called a Haouch and designated to extended families. The house is surrounded by its external thick windowless walls and attached to three other houses in order to provide a minimum exposure to solar radiation. The walls are constructed from local materials such as 'gypse' (gypsum) which help to improve thermal comfort in summer by absorbing the heat during the day and releasing it at night. Also, sand does not store much heat due to the air between its particles. It cools down quickly after sunset and may even generate morning fog in desert conditions. The thermal performance of flat roofs has been improved by adding thick layers of earth. In the case when the roof is a dome (the area of a half sphere is three times that of a flat terrace), it will receive less radiation by unit area. Therefore, it warms more slowly than a flat terrace (Fezzai et al., 2012).

The traditional house of Oued Souf comprises a semi-public transitional space 'Skiffa' which provides privacy of the courtyard from external strangers. The Skiffa is often endowed by use of a 'Khamsa': the image of the open right hand; a traditional way to protect the house from bad-eyes of other people. The doorstep permits the separation between the indoor and outdoor. Also, the house includes a kitchen, a cellar or 'Khabia' and a number of rooms 'Ghorfa' or 'Damsa'; if the ceiling has a form of a vault, the rooms will gradually be grouped together in order to satisfy the increased needs of the households (Belhadj, 2007).



**Figure 4.7: Plan of a traditional house in Oued Souf (Belhadj, 2007).**

In the North and South parts of the house, two covered spaces called 'Sabat' open onto the courtyard. The North Sabat permits a maximum exposition to solar radiations in winter while the South Sabat and an excavated cave provide the protection from heat in hot seasons (Belhadj, 2007).



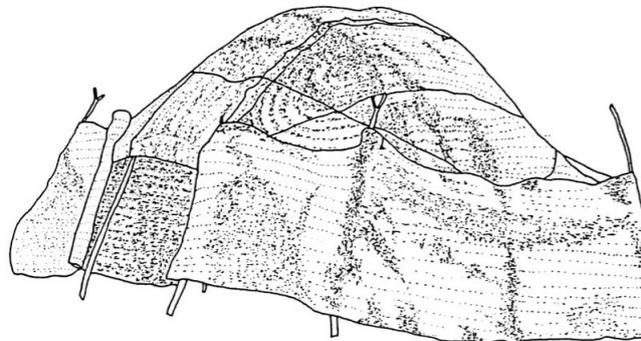
**Figure 4.8: Ruined traditional house in Oued Souf (Belhadj, 2007).**

### 4.2.3 The house of Hoggar.

The Touareg are the people who live in Hoggar, their origin is a mixture of Sudanese, Berbers and Arabs. The Touareg are a group of tribes who live in the Massif mountains of Hoggar in the extreme south of the Algerian Sahara, approximately between 20° and 25° latitude North, and 3° and 6° East (Benmatti, 1982).

The region of Hoggar is the highest region in the Sahara where many summits exceed 2500m. Despite its low latitude, the region is relatively favoured in terms of climate in comparison with other parts of the desert; it is less hot and better in rain.

The Touareg live in tents or they build 'Zeriba'. The tent of Touareg is quite primitive and consists of a wide leather velum formed by assembling tanned goat or sheep skins painted in red and sewn together. This roof is supported by a long wooden column in the centre and three other shorter than the first one: one in the middle of the open side of the tent, the two others are in the two extremities. Despite its primitive form, the tent can be closed at night almost completely which can protect the inhabitants from the cold nights of winter. One half of the tent is reserved for the man where he puts his clothes, his saddle and his weapons the other part is occupied by the woman where she puts her clothes, jewellery, her Imzad (musical instrument) and kitchenware. The two parts of the tent are not separated by any physical barrier (Demoulin, 1928).



**Figure 4.9: The tent of Hoggar (Source: Casajus, 2007).**



**Figure 4.10: Tents in Tamanrasset.**



**Figure 4.11: Interior view of the tent of Hoggar (Source: Casajus, 2007).**

The Zeriba is a hut representing an intermediate stage between the nomad tent and modern house. It is a form of traditional dwellings of the Touareg which is usually made of stones and covered by palm leaves (Figure 4.12). The Zeriba has generally a cubic form of 2.5 m each side and sometimes can be conical (Pandolfi, 1994).



**Figure 4.12: Zeriba of Touareg made of stones (Source: Wilaya of Illizi).**



**Figure 4.13: Zeriba made by palm leaves in Tamanrasset.**

#### **4.2.4 Traditional courtyards houses of Constantine.**

Courtyard housing is a universal type of habitat and it is not unique to the Arab world. It is widespread in diverse regions different in geographical location, climates, societies and culture as several civilisations have used it as the main design of housing since prehistoric times, such as: the Assyrians, Persians, Greeks, Romans, Byzantines and more recently in Islamic architecture. However, although courtyard housing was the most important aspect of traditional design in many parts of the world, there are significant differences of function and importance related to the interior courtyard in the Islamic region (Abdulac, 2012).

The importance of courtyards has increased under the influence of the Islamic religion; subsequently the Arabic architecture became characteristic in plan, in form and in decoration. In addition, the courtyard became one of the main architectural aspects of Arabic houses and gave the opportunity to a variety of associated developments: loggias, galleries, high level openings, oriels and elaborate sun-shade ornamentation (Edwards, Sibley, Hakmi, & Land, 2004).

The study of courtyard houses will focus on the medina of Constantine; the choice of this medina is based on its historical and architectural values presented in this section. By way of contrast and relevant to this thesis, there is a noticeable lack of any kind of traditional houses in Jijel which was a prefecture of Constantine until 1974.

The medina of Constantine is one of the oldest medinas in Algeria which dates from 3000 years B.C. It is situated in the centre of the North East of the country. The city was a base of the Phoenicians, Numidian, Romans, Vandals, Arabs, Ottomans and finally the French. The medina of Constantine is classified as a national heritage site. It is implanted in a rocky site and perfectly matches the morphology of it. The defensive rocky site of the past represented the traditional habitat which was divided into two parts since the first years of colonisation: the highest (Casbah) represented a traditional Europeanised habitat while the lowest part (Souika) which is the most important residential quarter also dominated by untransformed traditional courtyards houses (Bouadam-Ghiat, 2010).



**Figure 4.14: General view of the medina of Constantine.**

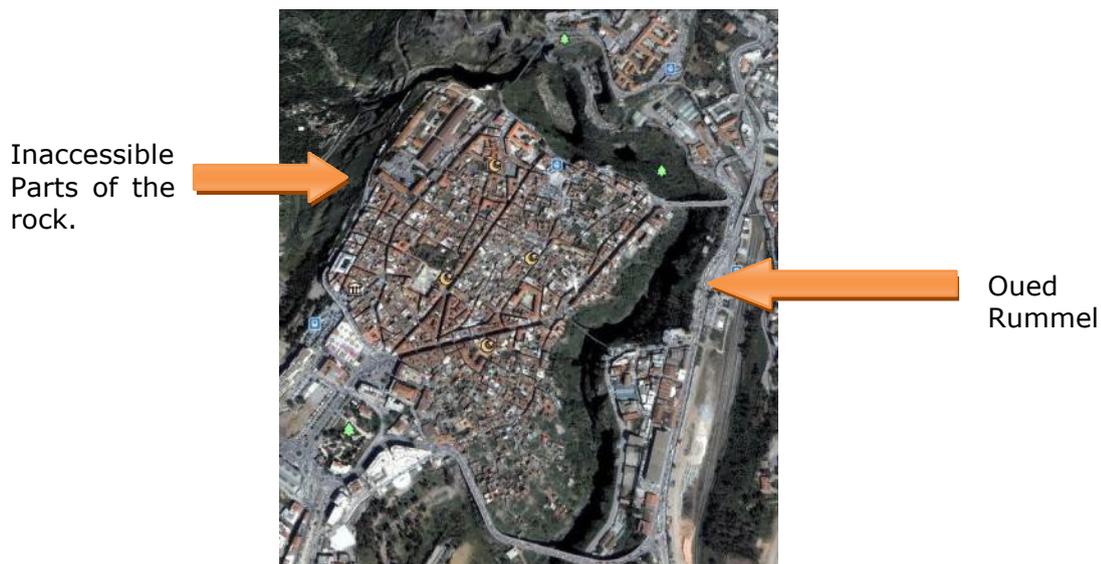
The urban fabric of the medina is extremely dense and homogenous with its cubic forms. The structure of urban fabric is divided in two categories:

#### **4.2.4.1 Ramparts and doors.**

The enclosure delimited the urban perimeter of the medina and protected the city from external invasions. One of the particularities of the site of Constantine is that the ramparts are existed only in the North, West and South- West; the other parts of the city are either protected by Oued of Rummel or are the inaccessible parts of the rock as shown in Figures 4.15 & 4.16.



**Figure 4.15: Birds-eye view of the medina (Source: Bernard Pagand, 1989).**



**Figure 4.16: Recent view of the medina Google Earth 20/05/2013).**

The enclosure is pierced by four gates which provide communication with the exterior world; three gates are situated in the South-West: Bab el Djabia, Bab el Oued and Bab el Djedid. The fourth one is Bab el Kantara in the East. These gates are related by principal routes which cross the vital centre of the city (Touam, 2012).

Figure 4.17 shows the dense urban fabric and the location of the four gates of the medina of Constantine before 1938 (Before impacts of French colonialism).



**Figure 4.17: Plan of the medina of Constantine before French colonialism -Before 1838-(Source: Bernard Pagand, 1989).**

#### **4.2.4.2 Streets and centre.**

The network of routes in the medina follows directly the morphology of the site. Unlike the streets and boulevards of occidental countries, the layout of roads has an organic plan and did not follow regular geometric form. The most important role of the roads is to relate the gates of the city.

The urban fabric of the medina is characterised by three principal streets. Figure 4.18 shows access to the main streets of the Medina.



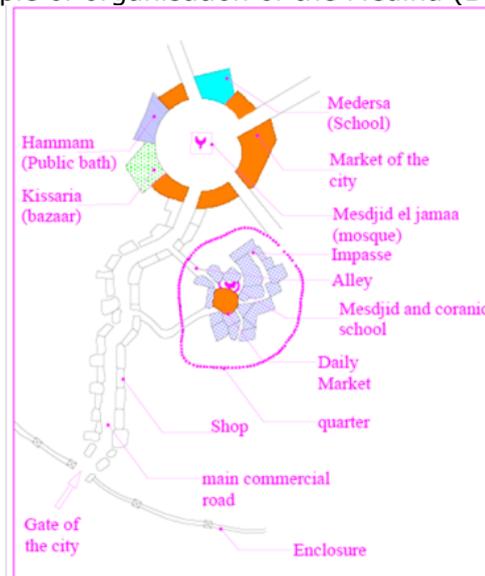
**Figure 4.18: Access to the main streets of the Medina.**

Along these roads are grafted the majority of public and religious infrastructures such as: Medersa (Islamic school), Hammam (public bath), Fondouk (Motel) and mosques. The most important road is the one that provides the link between the main gates: Bab el Djedid and Bab el Oued in one part and with Bab el Kantara in the other part. In this street, the grand mosque (el Djamaa) is located and the life of the city is organised and converges around and toward it.

The analysis of the plan of the medina shows that the urban fabric is constituted of two different urban forms:

- A central area of souks (markets) which is exclusively reserved for commerce and culture.
- A private residential area reserved for habitations.
- The division of these areas is explained by the principle of separation between public (commercial) and private (residential) zones.
- The public zone is marked by the hierarchy of commerce and craft activities along the main tracks which relate the centre of the city and the gates. The most important reason for this order is to separate craft activities that produce nuisance and pollution which have to be located in the periphery such as the tannery and production of copperware. Other commerce such as perfumery, jewellery and libraries surround the mosque in the centre of the city. This spatial organisation is based on the principles of Islamic society which concern the oppositions: Public/private and dirty/clean.

Figure 4.19 shows the principle of organisation of the Medina (Barkat, 2006a).



**Figure 4.19: the principle of organisation of the medina (Yousfi, 2006).**

#### 4.2.4.3 Spatial Organisation of Courtyard Houses in Constantine.

Traditional houses in the medina of Constantine have a simple irregular geometric form; it consists of a two or three-floor structure surrounded by external windowless walls and organised around the courtyard or *wast ed dar* (meaning the centre of the house). The houses are in most cases provided with pitched roofs inclined to the patio. Figure 4.20 shows the roofs of houses in the medina of Constantine.



**Figure 4.20: sky view of the medina of Constantine (Source: Yann arthus-bertrand).**

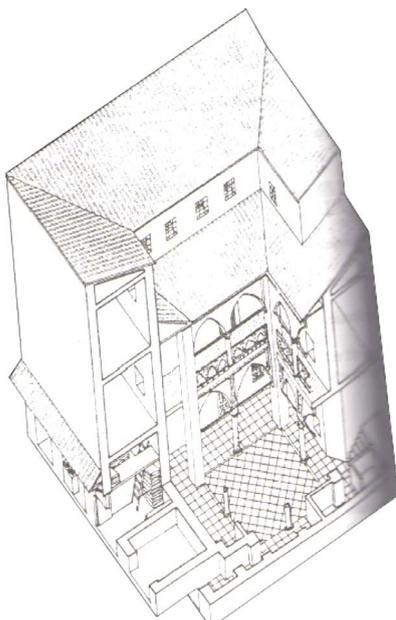
The plans of the houses are generally similar in their basic characteristics but may vary in details. Besides, spatial organisation and the hierarchy of spaces in the houses are very similar.

The courtyard house of Constantine is presented into three forms:

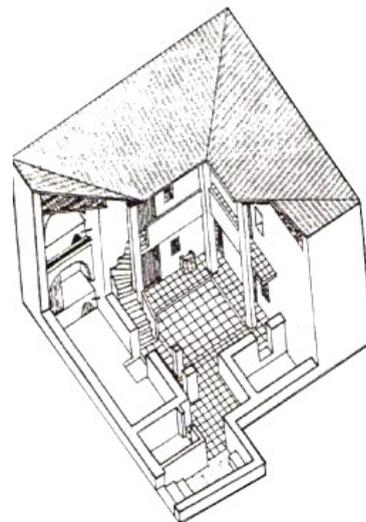
- House with columns and arches which was designated for rich families generally occupied by Turks.
- House with massif pillars and lintels, which present the real houses of Constantine, generally occupied by intermediate households.
- The third form is similar to the second one but the only difference is the elevation of the patio from the floor to allow the use of the ground floor as a store area. This type of houses is generally located in Commercial Streets.

Figure 4.21 shows axonometric sections of houses for both rich and intermediate households.

A)



B)



**Figure 4.21: Axonometric sections of houses for: A) Rich household, B) Intermediate household (Source: B.Pagand, 1989)**



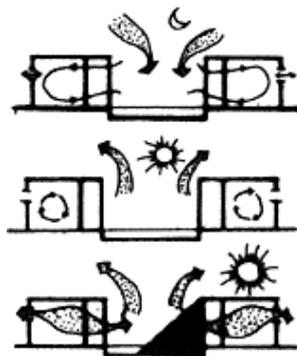
**Figure 4.22: Example of a courtyard in Souika for rich household.**



**Figure 4.23: Example of courtyard in Souika for Intermediate households.**

In this arrangement, there was no social or spatial segregation between poor and rich families as both lived next door to each other, the only signs of differences were the height of the house and the decoration of the external doors.

The courtyard receives and distributes sun light and fresh air to the other parts of the house (Barkat, 2006b).



**Figure 4.24: Distribution of air and solar radiations through the courtyard. (Edwards et al., 2004).**

Besides, the courtyard is the focus of different domestic and traditional activities such as food preparation of traditional bread and couscous, laundry, children's play, and outdoor living space. The courtyard is a circulation space surrounded by alleyways and three arched galleries which avoid any direct visual intrusion (from the semi-public spaces into the private central space of the house) and it provides a covered distribution and transitional space between the rooms and the open part of the court.

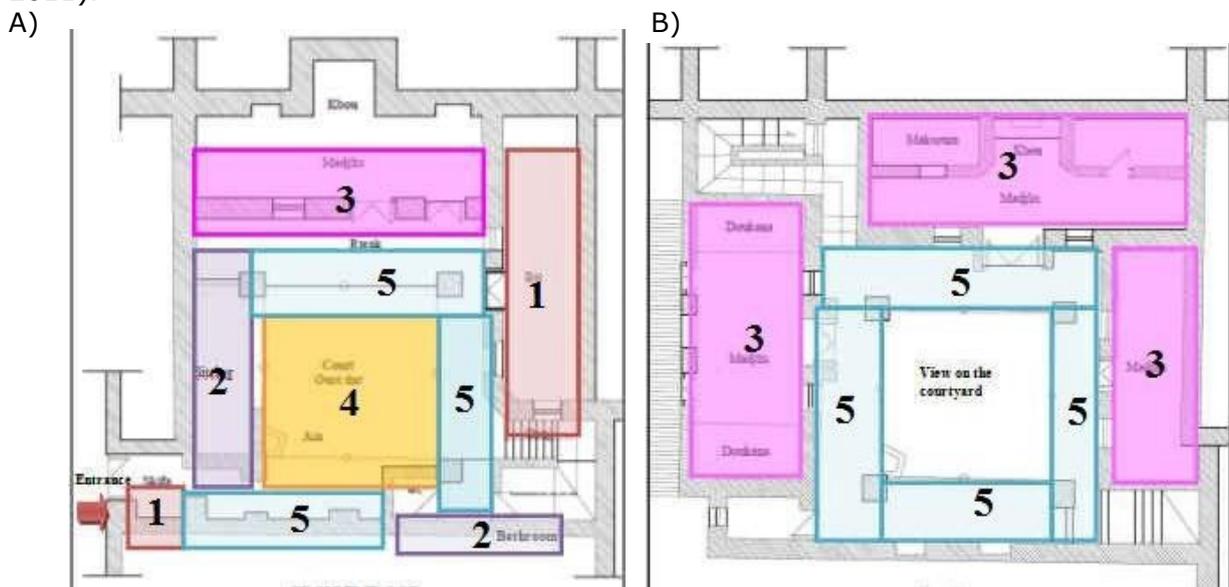
The courtyards of vernacular dwellings in Constantine have a regular form: square or rectangular. Their length is varying between 8 to 10 metres, while their depth is between 2-3 metres, possibly because of the limits of beams length (Barkat, 2006a).

The rooms possess in its extremities an elevated part *Doukana* (storage place).

The central area of the room (Kbu) is opposite to the door balances the two lateral sitting bays.

The house is accessed through a Skiffa, a small angled space which permits the transition between the public (exterior), semi-public and private spaces of the house (the alleyway and the west eddar). The Skiffa is the reception area for non-family visitors particularly men who are not allowed to enter into the house. This place is connected directly to a reception room which is the most decorated room in the house and designated to receive male guests.

Secondary areas such as kitchen(s), stairs, and storage are located in the irregular-shaped corners of the house far from the rooms, while the toilet can be located in the Skiffa. The stairs have generally a circular form in order to minimise the occupied surface area (Bakiri, 2011).



**Figure 4.25: Typical layout of a courtyard house in the City of Constantine, Algeria: A) ground floor, B) first floor.**

**Key: 1 = Public (Bit, skiffa); 2 = Semi-public (Services); 3 = Private (Female and family living, or bedroom); 4 = Open space (Courtyard); 5 = Transitional spaces (Riwak).**

Some of houses have decorative elements called 'Moucharaby' which are used to screen unglazed openings in a form of wooden lattice of cylinders joined with spherical joints. The light can be softly reflected and graded thanks to the round surface of the composing elements of the Moucharaby (Barkat, 2006b) (Figure 4.26).



**Figure 4.26: Traditional houses in Constantine.**

The Courtyard house marks an important aspect of domestic architecture particularly in Muslim regions and the Arab world. It is developed in different ways due to its responsiveness to existing local traditions, construction materials, social, economic, cultural, religious and environmental factors. Therefore, it presents a sustainable form of housing that many researchers recommend the use of the courtyard in new housing development in the Arab world (Edwards et al., 2004). In this thesis, the courtyard houses have been studied in order to learn from the sustainable form of design afforded, in addition to the sustainable way of life that our ancestors used to live. A questionnaire survey for the inhabitants of courtyard houses in Constantine was carried out as a part of this thesis. The questionnaire aims to assess the inhabitants' needs and satisfaction in terms of design. The results will be compared with those collective apartments and self-build houses in chapters 6, 7 and 8. These results will hopefully help to investigate sustainability potential in traditional courtyard housings to be combined with modern technologies in order to create new sustainable cities that suit present and future needs of the inhabitants.

### **4.3 Conclusion.**

This chapter investigated the different typologies of traditional houses and urban planning in Algeria. It presented the main characteristics of the Kabylia house, the Soufi house, the Zeriba of Hoggar. The chapter also presented an analysis of the courtyard houses of Constantine. It outlined the main features of the urban fabric of the old medina with special emphasis on the quarter of Souika where the Arabs or native people used to live during the colonial period. Finally, the chapter studied the main features of courtyard houses in the medina and the principal role of the court. This background information is not just a history lesson but it is needed to set the other research in context as it presented the different aspects and features of traditional houses that are suitable for the planning of new sustainable settlements. These aspects can be summarised on: the adaptation to climatic conditions, the respect of cultural and social values of the society and the use of local materials.

It can be concluded that vernacular houses in Algeria varied according to different climatic and geographical regions. Houses design, the use of local building materials and construction system were adapted for each region in order to cope with different environmental factors, thus each type fulfilled social needs and society values and traditions. However, it is so hard to live in the same way as previous generations used to live and it is crucial to study and learn from their experiences and the sustainable systems they introduced (Eiraji & Nambar, 2011). Also, the education of women and their integration in the society and in different fields of work has changed the relationship between women and men which consequently has impacted on people's lifestyle and created new social needs. Therefore, human behaviour and culture should be considered in housing design (Vaziritabar, 1990) and future cities should be created by learning from historic and traditional cities: conserving cultural heritage and promoting sustainable development in order to suit contemporary needs (Nasser, 2000).

The next chapter 5 will investigate sustainable design through legislations. The chapter will carry out a survey questionnaire with an influential group of stakeholders, architects and other professionals in building sector in Algeria in order to assess existing knowledge and attitudes. This aims to integrate the views of stakeholders into the design and construction process in a much more influential way.

## **Chapter 5 : Sustainable Design through Legislation.**

## **5.1 Introduction.**

This chapter investigates sustainable design through legislation. It starts by the investigation of the world's sustainability protocols which show the world concern about the future of the earth and the importance of sustainability worldwide and the need of studying sustainable development. The second part of this chapter studies the sustainability legislations in Algeria. It aims to assess the efforts made to tackle climate change and then save the environment in the country. This part concludes that the problem of the Algerian government is not about awareness but about who take the responsibility to reduce the danger that faces present and future generations. This conclusion is supported and evidenced by a survey questionnaire in the final and most important part of this chapter. The questionnaire was conducted with an influential group of professionals and stakeholders that have a great impact on the built environment with special emphasis on the housing sector. The questionnaire aims to assess the knowledge and understanding of professionals in Algeria in the field of sustainability. The questionnaire also included the professionals' suggestions in terms of future housing design.

The study of sustainability protocols and sustainability regulations are important to be addressed in this research in order to draw a clearer image of the actual position of Algeria towards sustainability.

This chapter aims to achieve the research objective number 3: To investigate sustainable development through legislation in Algeria. Also, this chapter strive to answer the research question number 2: Are professionals in Algeria aware of the sustainability issues? And it tests the research hypothesis that professionals are not aware as they should be in the topic of sustainability.

## **5.2 World's Sustainability Protocols.**

With a more environmentally-conscious world and increased awareness of the urgent need to tackle climate change, governments had organised world commissions and participate in global conferences in order to discuss solutions to deal with the problem. The study of these conferences and different protocols shows the world's concern and the serious problems that face government. Thus, it highlights the importance and the need for research in the field of sustainability.

The first conference that showed the industrialised world's concern on pollution and environmental degradation was the U.N. Conference on the Human Environment in Stockholm, Sweden in 1972. However, many developing countries at the Stockholm conference preferred to focus on reducing or eliminating poverty in their countries as it was more critical than environmental challenges. They argued that environmental problems were a result of economic development and that dealing with them should wait until their peoples had resources satisfactory for a decent and healthy life. In fact, the Stockholm conference produced a plan of action and resulted in the establishment of the first U.N. environmental agency represented in the United Nations Environment Programme (UNEP) in Nairobi, Kenya. The conference also motivated the foundation of environmental institutions and organisations around the world (Scherr & Gregg, 2006).

Few years later, by the mid-1980s, many developing countries recognised that they had to tackle their own extremely serious environmental problems. At this point there had been no attempt to address the important conflict between the need for rapid economic development and environmental issues. Consequently, The World Commission on Environment and Development (WCED) was founded in the late 1980s by the United Nations as a strategic means of compromise between the growth and non-growth factions. The commission report "Our Common Future", also known as the Brundtland Commission was issued in 1987. The report put the most common definition of sustainable development; it was defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs"(WCED, 1987). Sustainable development must be the aim of developed countries as well as the least developed ones. In fact it has to be the aim of the whole global community (Brundtland, 2007).

Sustainable development is generally focused to achieve progress in three areas which are

described as sustainability dimensions: economic, social, and environmental (Pawlowski, 2008).

The Brundtland Commission's work provided the basis for the United Nations Conference on Environment and Development (UNCED) known as the 'Earth Summit' convened in Rio de Janeiro, Brazil between the 03<sup>th</sup> and the 14<sup>th</sup> of June 1992. The summit's main purpose was to prevent the continued environmental degradation through sustainable design and create a development which can support socio-economic growth (Norman & Carr, 2009).

The conference was characterised by the participation of 108 governments represented by head of states, and a huge number of non-governmental organisations and non-state actors in order to lay a basis for a global corporation between the developing and the more industrialised countries, based on shared needs and common interests that would promise a healthy future for the planet.

Governments recognised the need of considering all environmental impacts in economic decisions. Consequently, eco-efficiency had to be a guiding principle for business and policy makers. The UN and Governments had to analyse and control the production of toxic components and poisonous waste. Although, efficient sources of energy was required to replace the use of fossil fuels which is a major source of greenhouse gas emissions that cause climate change. The conference had three main goals: to better the living standards of people in need; to improve management and protection of the ecosystem; and to bring about a prosperous future for all.

The Rio summit implemented Agenda 21; an ambitious and comprehensive programme for sustainable development which was negotiated over a period of two years. It included more than 3500 recommendations for action. The Summit created the U.N. Commission on Sustainable Development (CSD), which aimed to assess progress in implementing Agenda 21. The Summit also created a funding mechanism; the Global Environment Facility (GEF) which has afforded funding in developing countries for the implementation of environmental protection measures (Scherr & Gregg, 2006).

The Rio summit also adopted the United Nations Framework Convention on Climate Change (UNFCCC) which is a legal framework that aimed to deal with the topic of climate change. On the 21st of March 1994, the UNFCCC entered into force and near 192 countries ratified it. The purpose from the UNFCCC was to start taking into consideration solutions to decrease global warming (Gupta, 2014).

On the 11th of December 1997, the Kyoto protocol was established by the UNFCCC on Climate Change in Kyoto, Japan. The Protocol is an international agreement adopted and entered into force on the 16th of February 2005 (Erdogdu, 2010).

As a result of more than 150 years of industrialisation, developed nations are mainly responsible for the current high levels of greenhouse gases (GHG) emissions in the atmosphere. Thereby, the Kyoto protocol places a heavier burden on developed countries under the principle of "common but differentiated responsibilities". The protocol then committed 37 industrialised countries to reduce their emissions of (GHG) by 5.2% over the period of 2008-2012 compared to the year 1990.

The protocol recommended three mechanisms for developed countries to reduce their emissions: Clean Development Mechanism (CDM), Joint Implementation, and International Emission Trading. Developing countries were not set to reduce their emissions but they could adopt CDM projects or create their new own policies with respond to the Protocol objectives (Lau, Lee, & Mohamed, 2012).

The Kyoto Protocol currently covers more than 160 countries globally and over 55% of global greenhouse gas emissions. The Algerian government ratified the agreement on the 16th of February 2005 which came into force on the 17th of May 2005 (UNFCCC, 2010).

After a decade of UN major conferences and summits, UN member states came together in September 2000 in New York to implement the United Nations Millennium Declaration. The

Millennium Development Goals (MDGS) were presented in 2001 by the UN Secretary-General to be the guide to apply the Millennium Declaration with a deadline of 2015. The MDGs were eight goals for developing countries to reach, with financial support from industrialised States. The eight goals aimed to eradicate poverty, to stop the spread of HIV/AIDS and to enhance primary education in the World. The MDGs were considered to be successful but limited because it failed to consider many other aspects such as the source of causes of poverty, many environmental problems and human rights (Chasek, Wagner, Leone, Lebada, & Risse, 2016).

As a follow up to the Rio Earth Summit of 1992, the World Summit on sustainable development (WSSD) was held in between the 26<sup>th</sup> of August to the 4<sup>th</sup> of September 2002 in Johannesburg, South Africa. The summit assembled more than 20,000 participants, including heads of State and Governments, national delegates and leaders from nongovernmental organisations (NGOs), scientific community and other major groups. Due to the rapid growth in world population, the conference dealt with the following key themes: water and sanitation, energy, health, biodiversity and ecosystem management, poverty alleviation, climate and agriculture in order to improve human life and preserve natural resources (Carr & Norman, 2008).

According to Scherr (Scherr & Gregg, 2006), the Summit represented an impressive break with past U.N. conferences. In Johannesburg, governments recognised that they had failed to fulfil the objectives of sustainable development they made in the Rio Earth Summit. In fact, the World Summit aimed to fight world poverty and to achieve ecosystem security. Governments reaffirmed the Earth Summit commitments and lay a few additional objectives and timeframes (Von Frantzius, 2004). The most important targets of the World summit were:

- a. Water and Sanitation: to decrease by 2015 the number of people without access to safe water, and sanitation.
- b. Health: to install sound management of chemicals throughout their life cycle of hazardous wastes and ensure a rational use of chemicals in order to reduce their major negative impacts on human health and the environment by 2020. Also, to realise the new harmonised system for the organisation and labelling of chemicals worldwide by 2008.
- c. Biodiversity and Ecosystem Management: to reach major diminution in the present rate of species loss by 2010; provide new and further financial and technical resources to developing countries; to protect marine areas by 2012 and to restore fish stocks by 2015.
- d. Poverty Alleviation: to reduce significantly the proportion of the world's population whose income is less than 1 dollar a day and the number of people suffering from starvation by the year 2015.
- e. Climate: to ensure adequate fund by 2003-2005 in order to assist the implementation of the Montreal Protocol on substances that deplete the Ozone Layer; ameliorate access by developing countries to reasonable, accessible, cost-effective, secure and environmentally sound alternatives to ozone-depleting substances by 2010 (Von Frantzius, 2004).

At the end of the summit Governments were satisfied and congratulated each other for the successful result of the summit, meanwhile representatives of the general public and activists claimed that the summit failed to make a plan of real goals, timeframes and funding for implementation of Agenda 21. Also, the criticism was made that there was a good focus on poverty and sustainable development however no real commitments were made (Scherr & Gregg, 2006).

The 20-year follow-up to the Rio Earth Summit and the 10th anniversary of the World

Summit on Sustainable Development is the United Nations Conference on Sustainable Development (UNCSD), also known as Rio 2012, Rio+20 or Earth Summit 2012. It was held from 13 to 22 June 2012 in Rio de Janeiro, Brazil. The UNCSD was the largest world sustainability conference ever held with the participation of 191 countries, 44,000 participants, and 79 heads of State (Cicin-Sain, 2014). The conference allowed discussion of two key topics: the first being the problematic relationship between green growth, sustainable development, and poverty eradication; the second issue was institutional frameworks for implementing sustainable development (Bulkeley, Jordan, Perkins, & Selin, 2013).

The summit highlighted the importance of considering the three dimensions of sustainable development as the previous work was judged that it put much importance on the environmental dimension. Also, the conference focused on the need to integrate people life styles and cultural norms (Ishwaran, 2012).

The most important outcome document of the conference was – *The Future We Want* –. This document highlighted the importance of sustainable cities which have to be well planned and well developed. Also, cities can help to create economic, social and environmental sustainable societies. In this context, the document outlined the need for a rational approach to urban development and human settlements in order to produce affordable housing and infrastructure in cities and to give importance to slum upgrading and urban generation (Streimikiene, 2013).

At the Rio+20 conference, The United Nations (UN) Member states decided to negotiate a new agenda that could improve international coordination on human and environmental well-being in the post-2015 period. After three years of failure in reaching consensus on key decisions, UN Member States finally agree on a course that can transform our world on the 2<sup>nd</sup> August 2015 (Chasek et al., 2016). In this context, a new sustainable development agenda was adopted on the 25<sup>th</sup> of September 2015. Countries implemented a set of targets to end poverty, protect the planet, and ensure prosperity for all. In order to reach the targets, governments, the private sector, civil society and people should participate (United Nation, 2015). The 2015 report for the MDGs was positive but not completely satisfactory.

The 2030 agenda included 17 Sustainable Development Goals which replace the eight MDGs goals and complete what they did not achieve with 169 targets which will stimulate action for the next 15 years in different important areas for human and for the planet (McGranahan, Schensul, & Singh, 2015).

The worldwide concern for the future of the Earth can be reflected in previously cited conferences and more others meetings and releases. Obviously, debates and conferences are crucial, but the most important need is the rational application of the recommendations, policies and laws in order to achieve sustainable development (Al-Zubaidi, 2007).

### **5.3 Sustainability legislations in Algeria.**

Algeria, as has been shown in chapter 2 is one of the world's major oil producers with the hydrocarbons sector as the backbone of the economy, accounting for around 60 per cent of budget revenues, 30 per cent of the gross domestic product, and more than 95 per cent of export earnings (Amri, 2017; World Bank, 2015). The country has to reduce its emissions and offer a more sustainable life to its citizens. From its participations in the UN international commissions and protocols, it is obvious that the government is aware of the risks and the gravity of the current situation of the environment. However, has the Algerian government done enough to ensure a sustainable development?

According to the UN, since the Johannesburg World Summit in 2002, the Algerian government showed more focus on sustainable development and environmental protection with special emphasis on social and ecological aspects for societies. Thus, the government had implemented a National Environment Strategy and a National Action Plan for Environment and Sustainable Development which involved all ministries and administrative services, Local and civil society. This aimed to integrate environmental sustainability into the development strategy of the country in order to induce sustainable growth and reduce poverty; also, it aimed to set effective public policies in order to address environmental

issues linked to activities initiated by private sector (ONU, 2011).

In this context, the Algerian government had introduced a set of legislations and policies since 2001; the ones related to the built environment are: the law n°01-20 which was published on the 27<sup>th</sup> of December 2001, related to territory planning and sustainable development, the law n°03-10 which was published on the 19<sup>th</sup> of July 2003, related to the protection of the environment in the context of sustainable development and the law n°07-06 which was published on the 13<sup>th</sup> of May 2007 related to the management, protection and development of green spaces in the context of sustainable development (Bachar, 2015).

### **5.3.1 Law n °01-20 of the 27th of December 2001.**

The law n°01-20 which was published on the 27<sup>th</sup> of December 2001, related to territory planning and sustainable development. This law aimed to achieve a rational development of the national territory according to the particularities and different assets of each regional area. The law also aimed to achieve:

- The creation of favourable conditions to the national development of wealth and employment.
- Equal opportunities for promotion and development for all citizens.
- Encouraging the suitable distribution of resources between regions and territories, by reducing the pressure on coastal regions, metropolitan areas and large Cities and the promotion of mountain areas, regions of the High Plateaux and the South.
- Support and revitalisation of rural areas, Territories, regions and areas in difficulty, for the stabilisation of their local population.
- The rebalancing of the urban structure and the promotion of regional, national and international functions of metropolitan large cities.
- The protection and enhancement of ecologically and economically sensitive spaces.
- The protection of populations and territories against risks of natural hazards.
- The protection, development and the rational use of heritage, natural and cultural resources and their preservation for future generations (Algerian Official Journal, 2001)

This law had also introduced a number of planning instruments in the context of sustainable development. The most important was the plan of National territory planning (SNAT), which set the guidelines and requirements of national policy planning and sustainable development of the territory. In the respect of the SNAT, other plans have been established which are:

- The master plan of coastal management, designated for the coastal areas of the country, it sets the requirements for preservation and enhancement of these sensitive and coveted spaces.
- The master plan for land protection and desertification.
- The plan of regional planning of territory which specify the orientations and requirements specific to the program of each region.
- The plans for planning of the territory of Wilaya which specify and develop, in accordance with the regional development plan of the specified territory, the requirements specific to each Wilaya, in particular: the organisation of public services; Inter-municipal development areas; Environment; Hierarchy and thresholds related to the urban framework.
- Master plans for the development of metropolitan areas which replace the development plans of the territory of Wilaya (Algerian Official Journal, 2001).

### **5.3.2 Law n° 03-10 of the 19th of July 2003.**

Law n° 03-10 which was published on the 19th of July 2003, related to the protection of the environment in the context of sustainable development. This law aims to:

- State fundamental principles and regulations of environmental management.
- Promote a national sustainable development in order to ameliorate human life conditions.
- Protect the environment from all kinds of pollution.
- Restore damaged areas.
- Promote the national and ecological use of available natural resources as well as encourage the wise use of technology
- Reinforce public awareness and participation in the protection of the environment.

The law imposes financial penalties and in some cases imprisonment on everyone working against its principles (Algerian Official Journal, 2003).

This law was supposed to be applicable within two years after its first publication in the Algerian official journal in 2003. For this to take place, texts of application should have been published in the Algerian official journal by latest 2005. These texts of applications determine how the law should be applied. Interestingly, until this date there are no texts of application for this law.

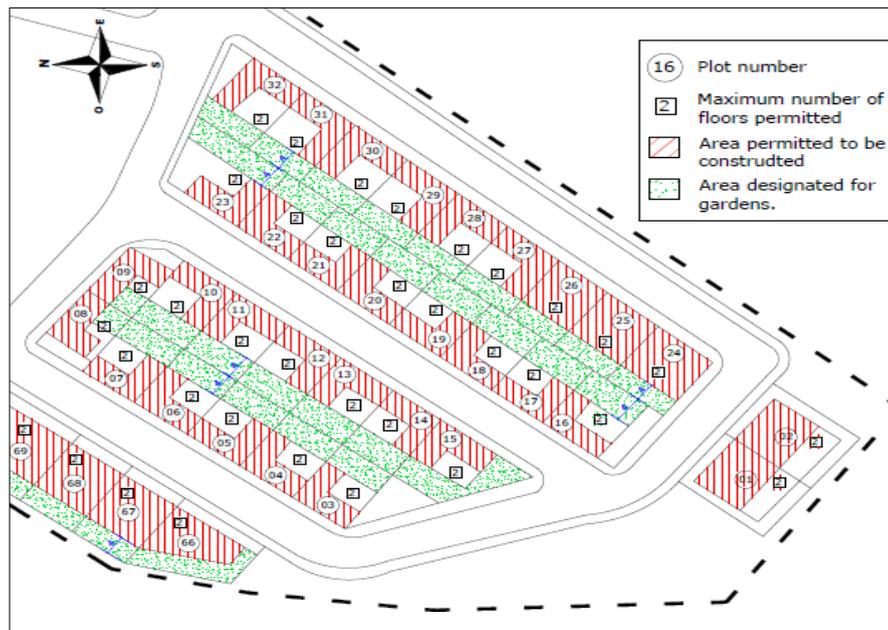
### **5.3.3 Law n°07-06 of the 13th of May 2007.**

The law n°07-06 was published on the 13th of May 2007 related to the management, protection and development of green spaces in the context of sustainable development. It aims to:

- Ameliorate urban life quality.
- Maintain and improve the quality of existent urban green spaces.
- Encourage the creation of all kinds of green spaces.
- Promote the extension of green spaces instead of built areas.
- Request the integration of green spaces in urban and architectural projects in both public and private sectors (Algerian Official Journal, 2007).

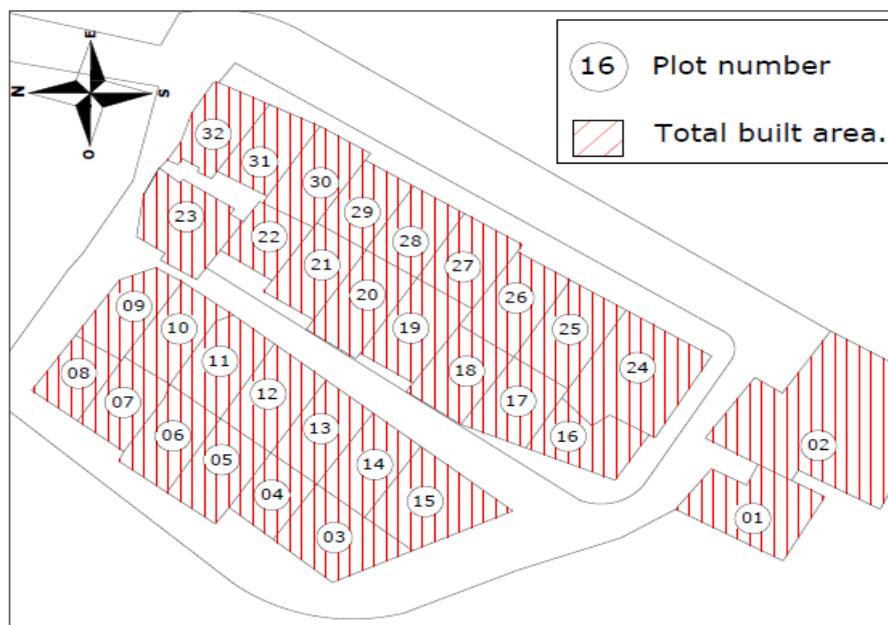
This law is strictly enforced by the authorities especially in cases when approval of permits of construction in urban and architectural projects is required. However, it is not necessarily being followed during the actual construction process.

For example, to build an individual house, the owner has to keep a minimum distance of 4 metres of a garden between his house and his neighbour's house. He gets building approval from the council for a plan that respects all regulations. Figure 5.1 shows the south part of a parceling plan in Tabbat Zerara Jijel, the plan shows the urban regulations applied in this building estate; it sets the maximum building area, the maximum number of floors and the distance that should be left between houses.



**Figure 5.1: Parceling plan for the south part of Tabbat Zerara building estate (Source: Based on the municipality of Jijel archives).**

Nevertheless, most people prefer to benefit from more living space in their houses rather than own a big garden. Figure 5.2 shows that none of the residents of Tabbat Zerara had respected the urban regulations set by the parcelling plan particularly the permitted building area.



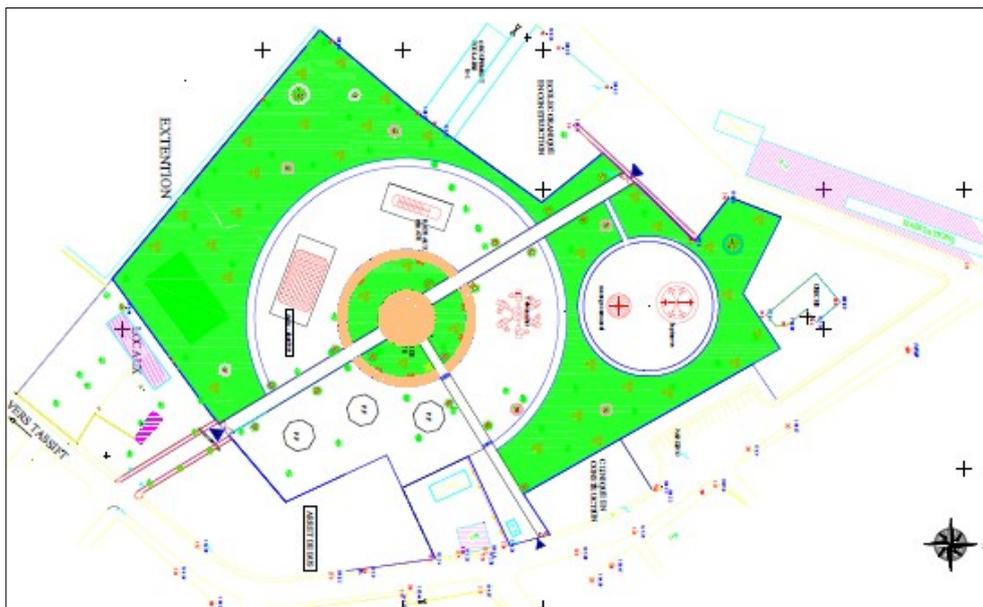
**Figure 5.2: The present situation in Tabbat Zerara estate (Based on Google Earth image 2017).**

Another example can be shown in Governmental projects in three major areas of Jijel started in March 2007 as a result to this law. The aim of the projects was to revitalise existing public gardens; the initial plans have been changed many times (five times for the plan of the garden in the municipality of Taher) in order to reduce the cost of realisation due to the lack of finance (DUAC Jijel, 2017). As a result, none of them have been completed yet. In fact, they have been completely marginalised showing that even the government does not necessarily respect its own regulations. Figures 5.3-5.4-5.5 & 5.6 show the

different stages of the project in the municipality of Taher.



**Figure 5.3: The initial plan Public garden in the municipality of Taher (January 2008)(Source: Private Bureau Boudraa Saida).**



**Figure 5.4: The final plan of public garden in the municipality of Taher (February 2012) (Source: Private Bureau Boudraa Saida).**



**Figure 5.5: Public garden in the municipality of Taher: the present situation, (June 2017).**



**Figure 5.6: Public garden in the municipality of Taher, (3D of the initial plan)(Source: Private Bureau Boudraa Saida).**

To sum up, it seems that the Algerian government is aware of the risks that threaten the environment through its participation in the world commissions. But, neither the government nor the citizens are willing to take responsibility to reduce the danger that faces present and future generations. This conclusion is further investigated by a survey questionnaire.

#### **5.4 Survey of building professionals.**

Survey method is described as the powerful and the best tool for the study (Thwaites Bee & Murdoch-Eaton, 2016). The research project is involved in integrating the views of stakeholders into the design and construction process in a much more influential way. However in order to do this, existing knowledge and attitudes must be known. A number of detailed interviews have been carried out with stakeholders and designers. A total number of 40 Participants were selected carefully (architects, engineers and planners) working in either private bureau or public administrations in the township of Jijel (Department of housing, department of urbanism, architecture and the city, municipality of Jijel and the land management agency) to represent different professionals that work and may affect the design and urbanism in the city. This questionnaire aimed to assess the knowledge of stakeholders and planners in Algeria in terms of sustainability which can affect the quality of housing design and the sustainability of the built environment. It also sought views and understanding on differences between traditional and modern design of dwellings. The results of the survey are reported here.

##### **5.4.1 Results and discussion.**

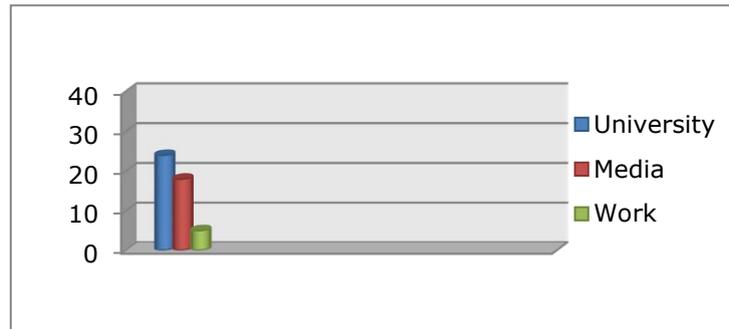
**Q.1.** Do you have an idea of the objectives of sustainable development?

The analysis of the collected answers shows that (34) professionals answered that they have an idea of the objectives and on what makes a building sustainable; however, only 7 out of 40 gave a suitably detailed definition and the others just related the subject to energy consumption. It was clear that the majority of professionals do not have sufficient understanding of the subject of sustainable development which affects the quality of the built environment.

**Q.2.** How have you heard of the concept of sustainable development?

24 professionals heard of the subject at university, 18 from media and only 5 were made aware of it through their jobs (Figure 5.7). In fact, 34 out of 40 thought that the Algerian Government is not making sufficient effort to raise awareness amongst public and

professionals on the topic of sustainability. When asked to justify their answers, a total number of 15 did not give an answer. A professional architect stated: "the lack of seminars for raising awareness and the lack of the concept of sustainable development in urban regulations".



**Figure 5.7: Source of information of sustainability for professionals.**

**Q.3.** What do you think of the building sector and urban design in Algeria during the last 50 years (after the independence; 1962)?

The vast majority (37 out of 40) of the architects interviewed thought that the quality the built environment and urban design in Algeria is poor and lacks respect of urban regulations.

When asked to justify their answers 35 out of 40 gave responses and 10 of them related the poor status of the built environment to the no-respect of the existing urban regulations.

A respondent who is an architect working in his private bureau stated: "Buildings are constructed in an anarchic way without any respect to urban regulations and urban master plans"

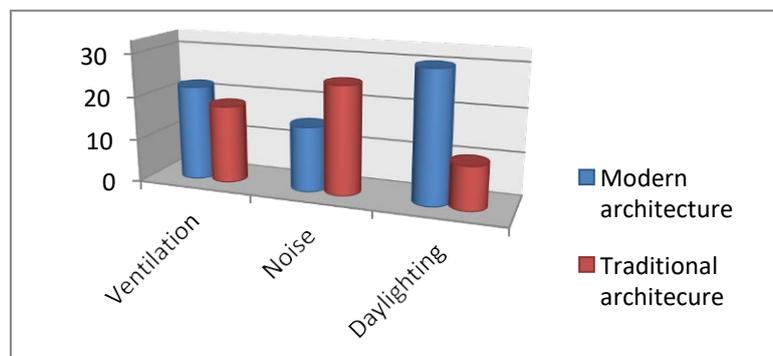
**Q.4.** In your opinion, which of these types of houses is more sustainable than the other?

In relation to comparisons between modern apartments and traditional courtyard houses in terms of sustainability, 25 out of 40 respondents preferred the traditional house. Some of them argued that the traditional design respected the lifestyle of the local inhabitants and that the courtyard provides more natural light and better ventilation to the dwelling.

An architect respondent stated: "the traditional house respond to the principles of the bioclimatic architecture: compactly constructed, the use of local materials and orientation. It is a passive house".

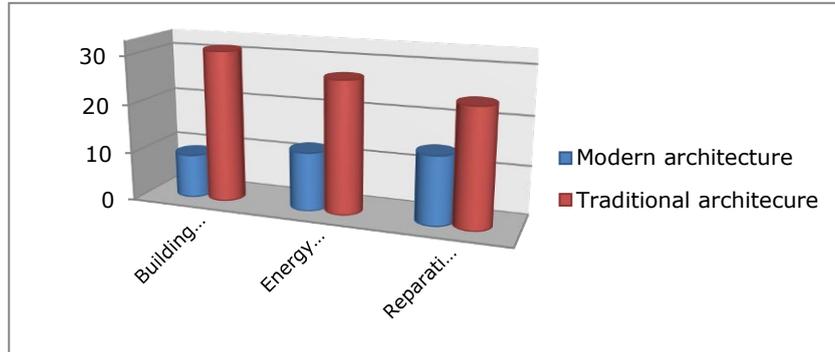
Another respondent said: "The traditional house is built according to cultural and social values of the Islamic religion. Also, construction materials resisted to bad climatic conditions".

However, in a more detailed comparison between these two types of dwellings in terms of comfort, the results were close when considering ventilation and noise. Interestingly, 30 respondents agreed that modern architecture provides better daylighting than the traditional one which contradicts the initial assumption. The results are presented in Figure 5.8.



**Figure 5.8: Ventilation noise and daylighting between Traditional and modern dwellings.**

On the other hand, the majority of interviewees agreed that traditional design meets the needs of local population in terms of building costs, energy consumption and maintenance costs. The results are presented in Figure 5.9.



**Figure 5.9: Building costs, energy consumption and reparation costs between traditional and modern architecture.**

More than half of interviewees (22 out of 40) also agreed that traditional architecture satisfies the needs of local population in terms of space, while only 17 out of 40 thought that modern design meets the needs of the inhabitants.

**Q.5.** Do you think that the current planning regulations can be applied to traditional architecture?

Only 11 out of 40 respondents agreed that traditional design respected urban level regulations in Algeria. Some of the interviewees thought that this due to the fact that these regulations were only devised sometime after traditional design has evolved.

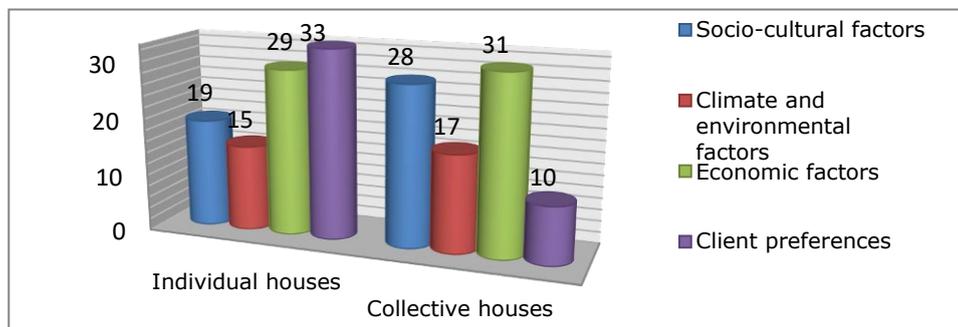
**Q.6.** Do you think that is important to consider the opinion of future inhabitants in the process of design of new houses?

A significant number of the interviewees (37 out of 40) agreed that it is important to consider the opinion of future inhabitants in the design of new houses. However, only 23 of them have consulted with future inhabitants.

**Q.7.** What are the factors that you take into account in the design of new housing projects?

The results of the answers for this question are presented in Figure 5.10. It is clear from the graphs that professionals mainly take into account clients' preferences and economic factors in the design of private projects (individual houses). In addition, socio-cultural factors and economic factors are more considered in the design of public projects.

Interestingly, it seems that climate and environmental factors are commonly neglected factors in both types of projects.



**Figure 5.10: Factors considered in the design of new Projects.**

**Q.8.** Comments and suggestions for future housing projects in Algeria.

A considerable number of 12 out of 40 did not give any answer. Just 9 respondents highlighted the need to integrate sustainable development principles into the design. Other 7 respondents have insisted on ensuring spatial comfort for residents.

A respondent stated: "Design houses with respect to the principles of sustainable

development and bioclimatic architecture".

Another respondent said: "The use of renewable energies in future housing projects in order to reduce energy consumption and the use of sustainable buildings materials in housing projects".

### **5.4.2 Major findings.**

From the analysis of the professionals' answers presented above, it seems that Algerian professionals are not as aware as they should be of the subject of sustainability and the majority blame the government for this. To tackle the issue, the author would propose the introduction of suitable continuing professional development (CPD) in the workplace. This strategy is already adopted in many countries such as the UK (RIBA, 2015) and ensures that professionals are kept up to date with progresses and developments in their field. This will hopefully increase awareness of the importance of sustainability amongst professionals and the author believes that this is a necessary step towards achieving sustainable design and development.

There is a general agreement that the traditional house is more sustainable in terms of cost, energy efficiency and space. Also, the majority of professionals agreed that modern apartments are more sustainable in terms of daylighting but the responses are nearly equal in terms of noise and ventilation.

Although, a significant majority agrees on the importance of considering the opinion of future inhabitants in the design of the house, this is only considered in individual housing and is of the lowest importance in collective housing. Although this is necessary, it is not possible to be realised in all types of projects.

Some of the interviewees suggested that the design of future housing projects should fulfil the 'real needs' of households and should consider the climatic and environmental factors of the region. Also, they stated that the Algerian government should improve the quality of housing in terms of space, comfort and aesthetics.

### **5.5 Conclusion.**

This chapter has investigated sustainability legislations with special reference to Algeria. This has started by citing the world's conferences and protocols in sustainable development which concluded that organising conferences and debates is crucial and show the worldwide concern for the future of the Earth but the most important need is the rational application of the recommendations, policies and laws in order to achieve sustainable development.

Then, the sustainability legislations related to the built environment Algeria has been presented. This has shown that the Algerian government is aware of the risks that threaten the environment by setting these laws. But, in fact neither the government nor the citizens are willing to take responsibility to reduce the danger that faces present and future generations. This conclusion was supported by a survey questionnaire in the final and most important part of the chapter. The survey was conducted with an influential group of professionals which proved that Algerian professionals are not as aware as they should be of the subject of sustainability and the majority blame the government for this.

The questionnaire had also included a comparison between traditional courtyard houses and modern houses; this resulted to a common agreement that the traditional house is more sustainable in terms of cost, energy efficiency and space. However, there was some confusion and contradiction amongst professionals on the issue of ventilation and daylighting. These results will be explored later in the thesis which will develop guidelines and proposals for future sustainable housing design; also it responds to the main purpose of this research which aims to investigate the aspects of traditional and contemporary architecture in Algeria which are suitable for the planning of sustainable settlements.

In the following chapters presented the results of questionnaires-surveys to assess the for inhabitants' satisfaction in terms of design conducted with residents of three different types of houses (Collective apartments and self-build houses in Jijel and traditional courtyard houses in Constantine).

## **Chapter 6: Residents' Evaluation of their House Environment.**

## 6.1 Introduction.

The main aim of this chapter is to present the residents' evaluation of their housing environments. It comprises three sections:

The first section includes a general presentation of the different field studies: the three collective houses estates, self-built houses in Jijel and the courtyard houses in the quarter of Souika in the city of Constantine. The survey with inhabitants of collective apartments was carried out with thirty households equally divided on three different types of governmental housing estates. The survey of self-built houses was conducted with ten households selected randomly from different parts in the city of Jijel. Finally, the survey of courtyard houses was carried out with eight households from the quarter of Souika in the medina of Constantine. The results of the surveys are reported here.

The second section presents the assessment of the external housing environments according to residents' responses. This includes different physical and nonphysical features such as: the distance from different amenities and services, the presence of green areas, children playgrounds and squares. Also, the level of security and measures undertaken by residents has been assessed. The results are support by photographic records and are followed by a discussion of each topic.

Finally, the third section presents the conclusion of the chapter.

## 6.2 Description of the case studies.

### 6.2.1 Collective houses.

Collective housing dominated the urban fabric of the city of Jijel without any consideration to the aspects of sustainability such as: comfort, climate adaptation, and the efficient use of construction materials, respect of social and cultural values of Algerian society, and many other aspects derived from the research carried out as part of this project. These will be discussed and assessed through the study of three different multi-storey housing estates in the city. Site 1 is the '400' social housing estate (400 LS), site 2 is the '170' social participatory housing estate (170 LSP) and site 3 is the '375' Promotional (Luxurious) housing estate (375 LP). The choice of collective apartments was based on the composition of the existing housing stock in Jijel which is mainly dominated with this type of dwellings. Also, governmental housing programmes in urban areas (as have been shown in chapter 3) are limited to collective houses in its different forms: social houses, assisted social houses which are replaced by promotional assisted houses and promotional houses. The research project included multiple-visits and extraction of information from official resources which is a major component of the research carried out by the author and the information below represents a distillation of that evidence.



**Figure 6.1: Location of the three sites of Collective houses.**

The questionnaire survey was carried out with ten households from each site (30 households in total); the methodology adopted in this survey is studied in chapter 2 of this

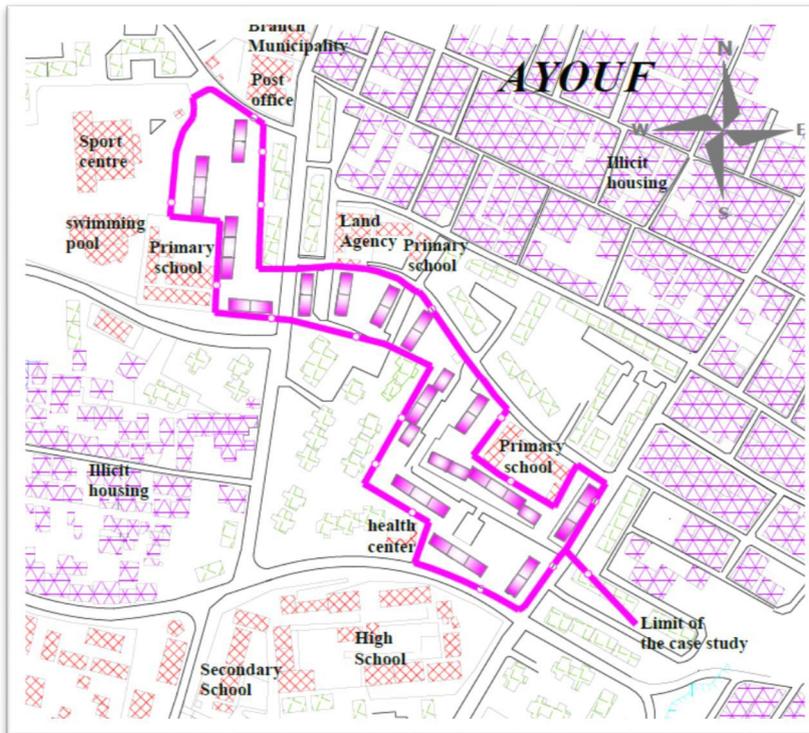
thesis. A particular emphasis was given to the selection criteria of these case studies which can be summarised as:

- Sites are constructed in different periods of time in order to assess the historical development of housing in Algeria.
- The distance and altitude above sea level, which can affect the microclimate (Rosenberg, Blad, & Verma, 1983).
- The presence of green spaces, playing areas for children and other necessary facilities that are crucial for the daily life of the residents.

**a) Site N°1: 400 social houses estate (400 LS).**

The housing estate '400 houses' was constructed in 1982 in Djebel Ayouf (ex-Camp Chevalier), where the first zones of collective housing were built in continuity with the old colonial city centre. The site is about 2 kilometres from the sea with an altitude of 77m (OPGI Jijel, 2013).

The estate consists of 41 five storey blocks of social apartment buildings where five of these blocks have the ground floor designated for commercial purposes. The buildings are organised in a non-regular form following the shape of the land plot as there was other collective buildings already built before this project. Figure 6.2 shows the location of the (400 LS) housing estate.

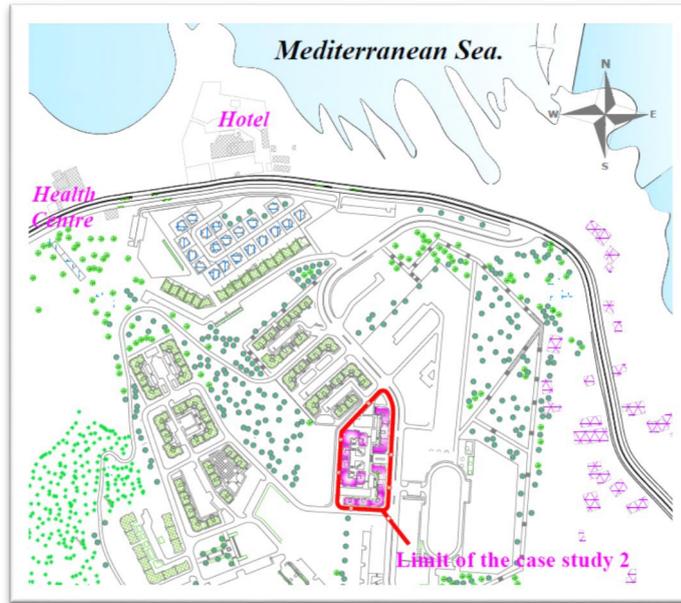


**Figure 6.2: Location of the 400 social houses estate.**

**(Source: the author based on PDAU Jijel).**

**b) Site 2: 170 houses Mezghitane (170 LSP).**

The construction of the housing estate of '170' houses was first started in 2005 in an area called Djebel Mezghitane, and until 2013 there were still two blocks which were under construction (in the last stage of finishing works) (AWGRFU Jijel, 2013). Mezghitane is a new building site which used to be forestry land, exploited in response to the housing crisis in the city. The site is located in the West exit of the city, about 4 kilometres from the city centre; with an altitude of 157 m above sea level (POS Mezghitane, 2005). Figure 6.3 shows the location of this housing estate in Mezghitane.



**Figure 6.3: The location of 170 LSP houses in Mezghitane (Source: PDAU Jijel).**

The estate is divided into two different projects in terms of architectural design: One consists of 6 linked blocks of a total of 70 apartments and the second has a total of 8 housing blocks of 100 apartments. The two projects styles have six floors; the ground floor is designated for commercial use. Each project comprises two different blocks: a straight part with two apartments per storey, the second is an angled block with three apartments per floor. Figure 6.4 shows the position of apartment's blocks in the housing estate 170 houses in Mezghitane.



**Figure 6.4: Layout of blocks in site 2 (Source: AWGRFU. Jijel).**

The two projects are arranged in a form that creates semi-public areas in order to allow children to play in secure places, and provide quiet squares and places for residents to gather. However, the play areas and green spaces shown in the plan (Figure 6.4) are just proposed areas as the work on site was stopped due to financial conflicts between the entrepreneur in charge of the development and the management agency (AWGRFU Jijel, 2013).

**c) Site 3: The 375 promotional (Luxurious) housing estate.**

The promotional or luxurious housing estate of 375 houses was constructed after July 1997 (Date of approval of the permit of construction) in ZHUN 3 (New Zone of Urban Habitat) in Jijel by EPLF (Public Entrepreneurship for Family Dwellings). The total area of the site is about 6 Hectares or 60000 square meters (OPGI Jijel, 2013).

The estate consists of 23 blocks of promotional apartment buildings where 18 of them have five floors and the remaining five blocks have also five floors but the ground floor is designated to commercial use. The buildings are organised in a non-regular form following the topography of the site and the property limits. The structure of the blocks is sustained by load-bearing walls and the Building's construction materials for the exterior and interior walls are fired clay Bricks. Figure 6.5 shows the location of the site.



**Figure 6.5: Location 375 houses estate.**

**6.2.2 Self-Build houses in Jijel.**

The incapability of the Algerian government to resolve the housing crisis and the continuing increase in housing demands had resulted in the emergence of new informal settlements in the cities, generally in the periphery. This kind of housing is adopted by middle income and wealthy families and not restricted to low-income households coming from rural areas. This type of self-build dwelling has resulted in the creation of a new form of multi-story family buildings (Belguidoum & Mouaziz, 2010). Figure 6.6 was taken from a new group of self-build houses in the city of Jijel.



**Figure 6.6: New site of self-build houses in Tabbat Zrara, Jijel.**

Self-build dwellings can be defined by one of these characteristics:

- Informal:

Progressive change of this type of dwelling is related to financial ability which makes the house a permanent working site and gives the colour of cement or bricks to the city (Figure 6.7 and Figure 6.8). Also, the increase in family needs including the number of rooms, the floor area needed and different facilities caused by the growing of the family size is one of the important causes of the transformation in dwellings.



**Figure 6.7: The colour of bricks and cement dominate the urban fabric of Jijel.**



**Figure 6.8: Continuing work in an individual house.**

- Spontaneous:

These dwellings occupied the maximum area of land that responds to the family needs without any respect to urban regulations that provide more exterior comfort for residents such as privacy as well as interior comfort such as daylighting and natural ventilation.

- Sub integrated:

The country has witnessed an acute rural exodus to towns in two different periods of time. The first one was after the independence in 1962 when people grouped in urban areas in order to ameliorate their living conditions. The second period was during the Algerian civil war between 1990 and 2000 when people escaped from rural areas to live in more secure urban areas. These periods marked a wide spread of informal settlements and shanty towns in the periphery of cities where unoccupied lands were available. However, these informal settlements were not always created by the rural population as some middle class and wealthy families from the city; have resorted to these kinds of houses in order to guarantee a better accommodation to their sons when they get married.

- Illegal:

Illegal dwellings are usually constructed without the permit of construction. This is generally due to the fact that people can't prove legal possession of the land which is an important condition to get the permit of construction. In other cases, the house is built with a permit of construction but with disrespect to its directives.

The permit of construction was set by law N°90-29 on the 1<sup>st</sup> of December 1990 in relation to planning and urbanism. It is required for the construction of any new buildings in Algeria regardless of its use: for an extension of existing buildings, modification of the building when the work is related to the main structure or to facades overlooking the public space, also, it is necessary in the realisation of retaining and enclosure walls (Algerian Official Journal, 1990)(Algerian Official Journal, 1990).

During the year of 2015, a total number of 197 new infractions were registered in the municipality of Jijel (Municipality of Jijel, 2016). These infractions were represented in:

- 152 new dwellings were built without a permit of construction.
- 6 houses were built without respect to the directives of the permit of construction.
- 32 houses were built on government owned land.

A good initiative was set for the first time by the new mayor of Jijel who ordered the demolition of illegal houses; 185 such decisions were taken resulting in the destruction of 65 houses (Municipality of Jijel, 2016). Figure 6.9 shows destroyed illegal constructions in the land selected for the project of 400 LV houses in Amezoui, Jijel.



**Figure 6.9: Destroyed illegal constructions in Amezoui, jijel.**

Another proof of violation of law can be shown by the number of rejected applications for compliance certificate. This certificate is of primary importance if the owner wants to rent or sell the building. This verifies the conformity of the building with the provisions of the construction permit and covers: planning, shape, use and the facades of the building (Algerian Official Journal, 1990).

In 2015, forty applications were lodged at the municipality of Jijel; only 12 of them were accepted. The reason for rejection was infringement of the directives of their construction permits (Municipality of Jijel, 2016). Unfortunately, some of the rejected applications can be regulated through the law 08-15 of regularisation of the 20<sup>th</sup> of July 2008. This law aims to legalise buildings constructed before 2008 which have or not a permit of construction. Therefore, the government is encouraging avoidance of regulations whilst it set a strong legal framework trying to organise the built environment.

Due to the popularity of this kind of houses the questionnaire survey was conducted in order to evaluate the inhabitant's satisfaction of the design of their dwellings. The survey was carried out with ten households in Jijel between May and July 2015. The questionnaire was distributed to households selected randomly from different part of Jijel. The choice of location is justified by the desire to cover a maximum area of the city in order to evaluate the availability of urban places and public facilities of different areas in Jijel. Respondents were given sufficient time to answer and return their answers to researcher after a period of time that was previously fixed by them.

### **6.2.3 Courtyard houses of Constantine (The quarter of Souika).**

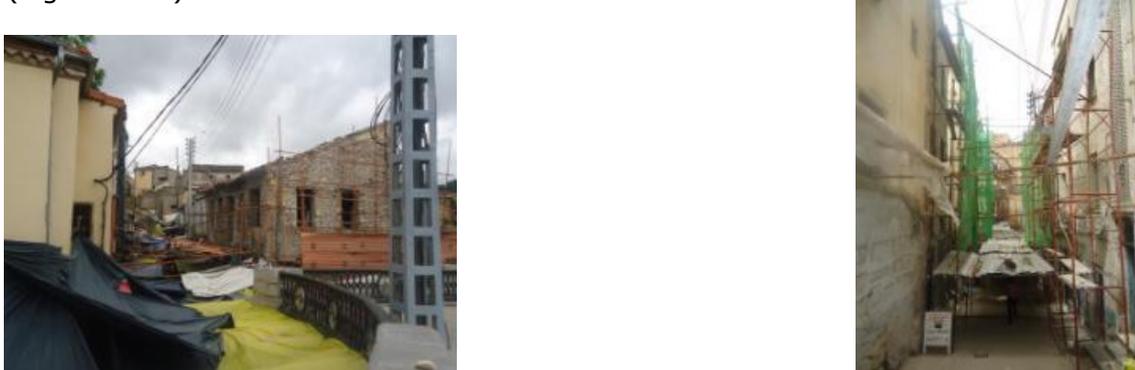
The importance of courtyards was increased under the influence of the Islamic religion; subsequently the Arabic architecture became characteristic in plan, in form and in decoration. In addition, the courtyard became one of the main architectural aspects of Arabic houses and gave the opportunity to a variety of associated developments: loggias, galleries, high level openings, oriels and elaborate sun-shade ornamentation (Edwards, Sibley, Hakmi, & Land, 2004). The study will focus on the medina of Constantine as one of the oldest medina in Algeria with particular emphasis on the quarter of Souika. The old quarter of Souika is situated in the South East of the Medina; it still conserves the major

part of urban structure and cultural edifices, despite some natural decay caused by the lack of maintenance and the over-occupancy of constructions (Figure 6.10).



**Figure 6.10: Demolished houses in Souika.**

Other buildings were also been destroyed as a part in the operation of rehabilitation of the medina included in the permanent plan of safeguarding and enhancement of the old city (Figure 6.11).



**Figure 6.11: Rehabilitation of some houses in Souika.**

Although, its location in the city centre, the quarter still possesses its original limits and its access points are identifiable. The plan of Souika is composed of a homogenous irregular urban fabric. Street design in the quarter as many other traditional Islamic cities in the world; is diversified according to the geographical location, type and function such as: residential or commercial.

The residential clusters form small neighbourhood units within which basic facilities are provided such as a bakery, a public bath, a small mosque and a Qur'anic school. The clusters are formed by a maze of roads with a spatial hierarchy from winding alleyways ending in a cul-de-sac which maintains the relationship: Public/Private.

Streets in residential areas are either partially covered by cantilevered volumes *Sabat* or totally by additional living spaces (Bouchareb, 2006). Figure 6.12 shows a residential street in Souika covered by a *Sabat*.



**Figure 6.12: Residential Streets covered by Sabat.**

The main street Larabi Ben M'hidi which serves Souika, relates the quarter to the rest of the city. This street has a considerable width compared to the rest of roads that cross the neighbourhood. Secondary roads are relatively narrow and are not accessible by vehicles; they relate the main street to another important road Mellah Slimane which is the public commercial axis of the neighbourhood. Also, the secondary streets provide the link between the two principal axes and the 'impasses' that allow the access to houses.

Therefore, the hierarchy of streets is represented as follows:

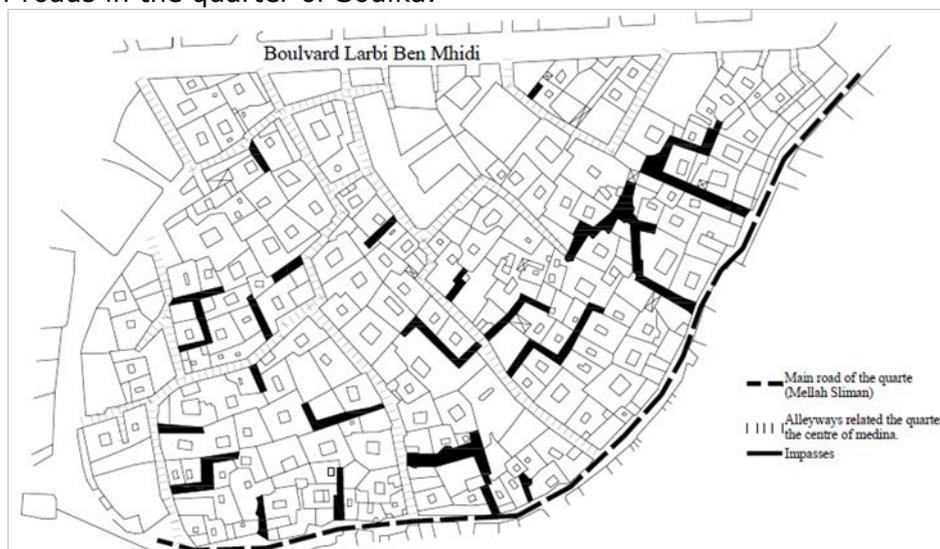
- A commercial axis as a public street.
- Secondary roads as semi-public streets.
- Alleyways and impasses as private roads.

The opposition between the main commercial axis (Mellah Slimane) and the private impasses is one of the important characteristics of the residential urban fabric of the Arab-Islamic medina (Touam, 2012).



**Figure 6.13: View of the main road of the quarter (Mellah Selimane).**

This opposition allows the separation between the private domain of housing and the public areas in order to provide privacy of houses on the urban scale. Figure 6.24 shows the hierarchy of roads in the quarter of Souika.



**Figure 6.14: The traffic network in Souika (Yousfi, 2006).**

The survey was conducted in May 2015 with eight households. The researcher carried out face to face interviews due to the difficulty to find the houses in the future. Also, the number of interviewees was limited due to the large number of households that refused to respond. These households answered that they received a large number of researchers and students but without any improvement of the situation of their houses.

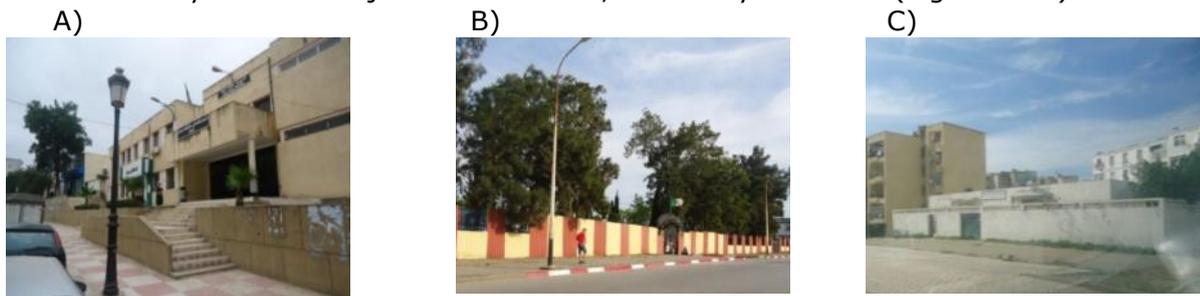
### **6.3 Analysis of the inhabitants' survey.**

The quality of the urban built environment is an important issue in urban planning. Urban form and activities occurring in neighbourhoods should be balanced in order to create a well-built environment. In addition, communities that are provided by services and facilities offer a more modern living standard and a better lifestyle that afford people's different needs and offer a variety of recreational activities in particular geographic areas (Altschuler, Somkin, & Adler, 2004). This part of the thesis contains the analysis of the results from the inhabitants' survey in order to assess the quality of their external housing environment. Also, some observations have been recorded based on the residents' comments that have been reported here and they have informed some of the research conclusions.

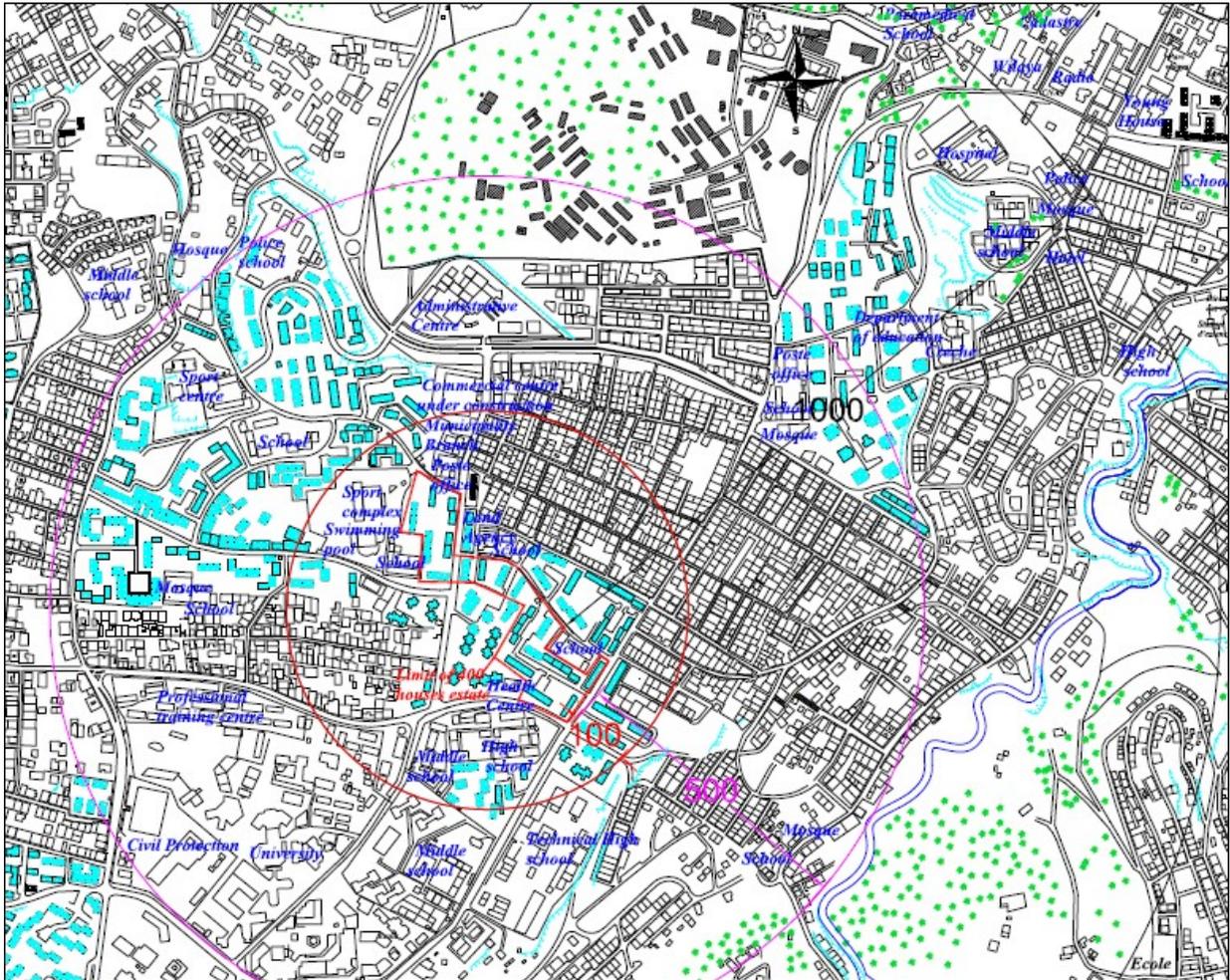
#### **6.3.1 Services and amenities.**

##### **a) Collective houses.**

In 400 social houses, the estate is surrounded by a variety of amenities and facilities needed in daily life (100 metres from it or less) such as administrative amenities (post office, Municipality Branch, schools, sports centres and the business area where most of the important administrative management centres are located). Also, there is a variety of shops and daily informal souks of fruits and vegetables, bus stops that link the estate to the different parts of the city. Other important activities run in some apartments such as doctors' offices, dentist surgeries and lawyers. All these facilities make the estate a dynamic pole of residence and seem to provide some level of comfort to the dwellers. This was confirmed by the results from the questionnaire because more than half the respondents state that they are able to just walk to work, university or school (Figure 6.15).



**Figure 6.15: A variety of amenities surrounding the estate: A) Post office and Municipality branch, B) Health centre & C) High school.**

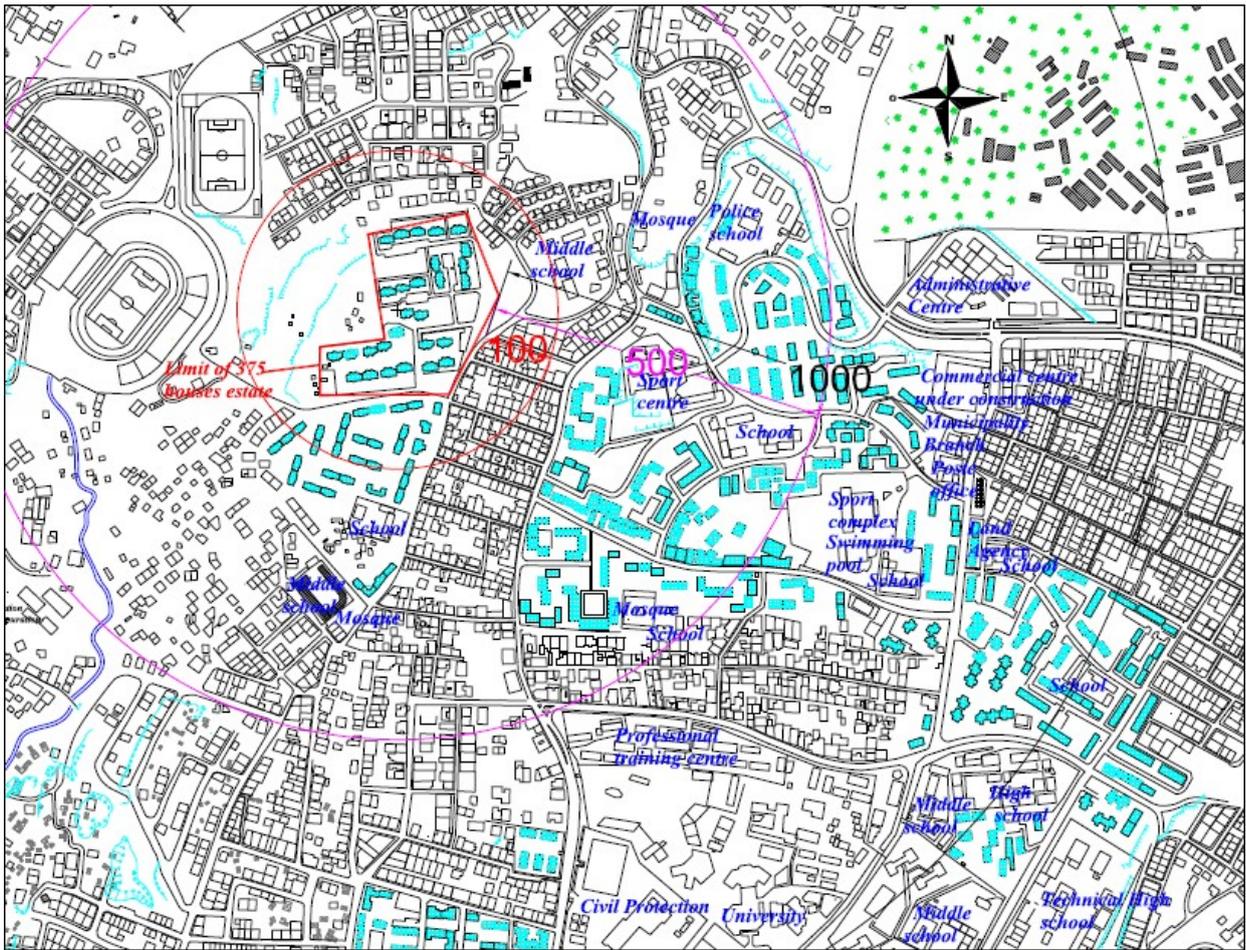


**Figure 6.16: Location of the 400 Social houses.**

**(Source: the author based on PDAU Jijel).**

Mezghitane estate is devoid of any other facilities except a primary school. However, the land occupancy plan (POS) planned a variety of services and amenities needed in the daily life of residents.

The 375 promotional houses estate is well located and surrounded by a variety of amenities and facilities needed in daily life (typically located within 100 to 1000 metres away) such as administrative amenities (primary and secondary schools, sports centres, mosques and the university). Also, there is a variety of shops, bus stops that link the estate to the different parts of the city. This location provides some level of comfort to the dwellers.



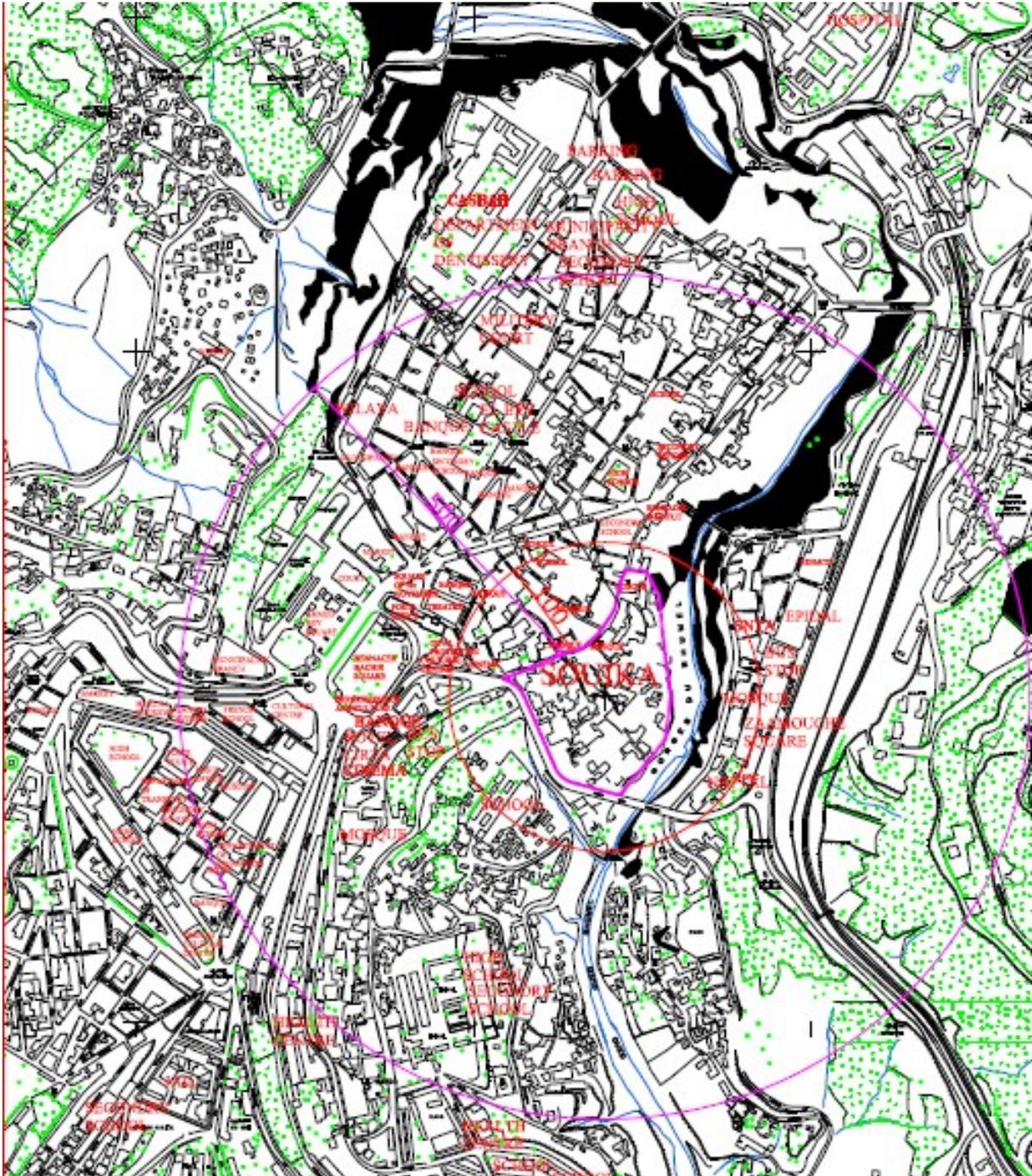
**Figure 6.17: Location of 375 houses estate.**

**b) Self-Build houses.**

The chosen self-build houses have different locations but all are in or very close to the city centre of Jijel. This can explain that no one of the interviewee is claiming about the distance from necessary services needed in daily life.

**c) Souika.**

Due to its location in the city centre, the quarter of Souika is close to all necessary services and amenities needed in daily life and a considerable number of different administrative departments (typically located within 500 metres away). In fact, this part of the city has some autonomy from the city centre thanks to the development of commerce along the street Mellah Slimane which played an important role as an element of urban structure. This street has acquired a great reputation recently due to the spread of black market and scarce products (Touam, 2012).



**Figure 6.18: Location of Souika.**

### **6.3.1.1 Discussion.**

Good access to community facilities and satisfactory provision of necessary services and amenities needed in daily life within walking distance are essential standards of a comfortable living environment and strongly related to people's liveability standards (Lang, Chen, Chan, Yung, & Lee, 2018).

The exterior environment and the existence of different amenities and services needed in daily life have affected the satisfaction of residents. It is true that new agglomerations are planned within all necessary public amenities and facilities. However, the way those houses are delivered before providing the minimum of needed services even public transport (the example of Mezghitane estate) resulted in some difficulties and create an uncomfortable living environment for residents.

### 6.3.2 Green areas.

#### a) Collective houses.

The three studied estates lack planted green areas; although there are many areas designated to be green as illustrated in Figure 6.19.



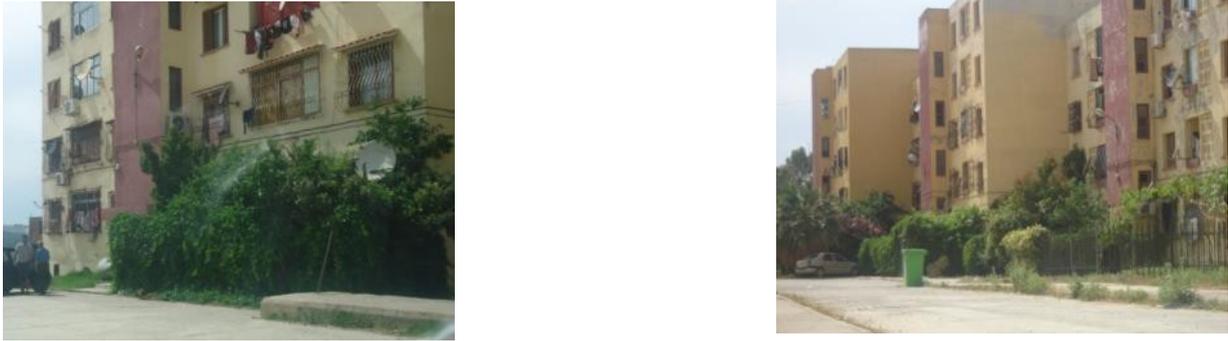
**Figure 6.19: Area designated to be planted in: A) Mezghitane, B) 400 houses site and C) 375 houses site.**

The inhabitants in Mezghitane consider that green areas in the estate are not enough as 50% of them answer that there is nothing of value there and the rest 50% consider that there is just little. In 375 houses estate the results are mainly the same; as 40% of the residents answered that there is little and 50% see that there is nothing. In 400 houses estate the image is quite a lot better as 20% of the inhabitants see that there is enough green areas, 50% of them answer little and the rest 30% consider that there is nothing.

Some inhabitants of the ground floors in collective houses enclosed the surrounded areas adjacent to their blocks and planted them which created some sort of private external green spaces (Figure 6.20). In fact, this act is not permitted by local municipality as the use of such places should stay public and shared between all residents.



B)



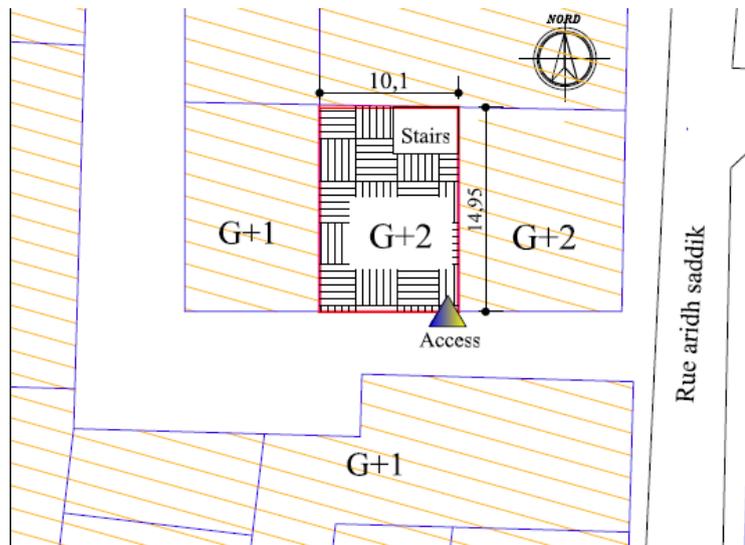
**Figure 6.20: Public areas enclosed by residents of ground floor to make private green spaces in: A) 400 houses site and B) 375 houses site.**

**b) Self-Build Houses.**

The interview responses of the ten households stated that their estates lacks planted green areas. Their answers on how many green areas are in the estate are presented in Figure 6.23. (70% stated that there is nothing and the remaining 30% answered that there is little green areas in the estate).

The inhabitants claim that the estate is devoid of green public spaces; however, they could reserve space for a private garden in their house but they prefer to build the maximum in order to gain more floor space inside the property.

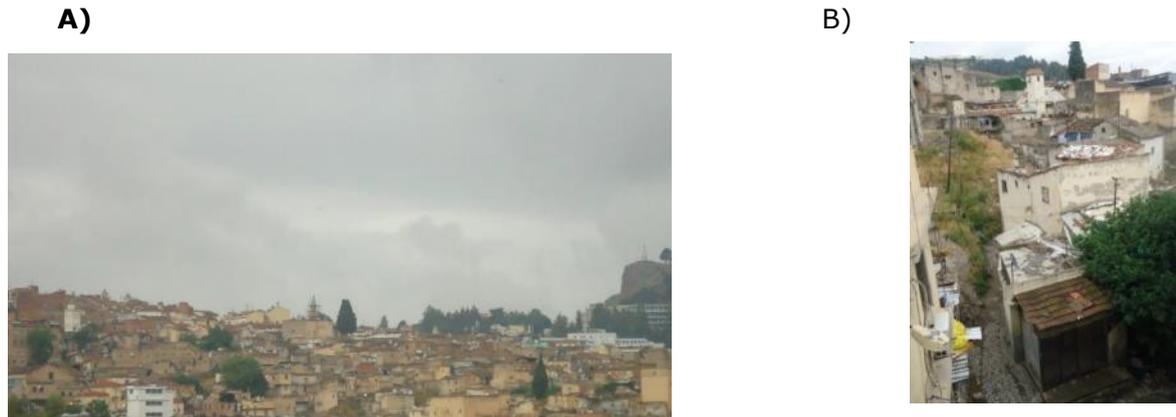
Figure 6.21 shows an example of an interviewed house built in total area of the plot which is 151 m<sup>2</sup> without leaving a space for a private garden.



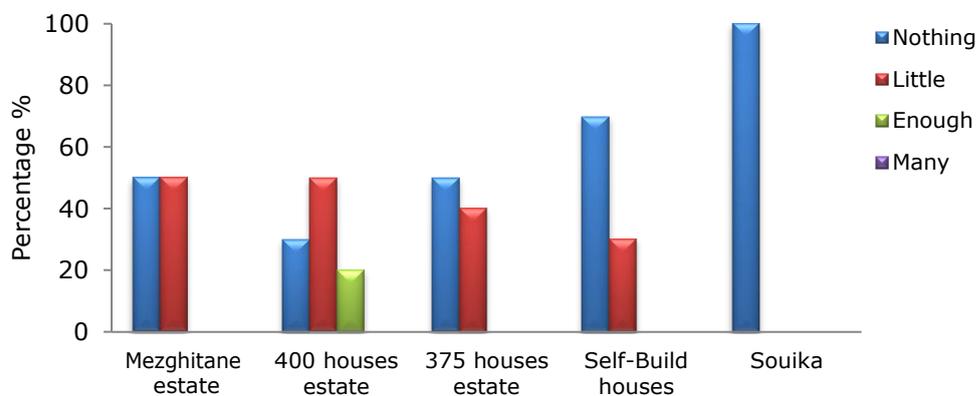
**Figure 6.21: Example of a self-build house built in the total area of the plot.**

**C) Courtyard houses of Souika.**

In the site, there is a considerable lack of planted green areas due to the dense urban fabric of the medina and the lack of space that can be designated to be green. Although, there is a small number of scattered trees and unarranged green spaces that took the place of destructed houses (Figure 6.22). All the inhabitants replied that there are no green areas in the site.



**Figure 6.22: Scattered trees in: A) General view of the Medina of Constantine, B) Souika.**



**Figure 6.23: Inhabitants' estimation to the presence of green spaces in their housing environment.**

### 6.3.2.1 Discussion.

According to Takano and colleagues (2002) green public areas afford comfortable and enjoyable living environments for urban residents and positively affected their longevity (Takano, Nakamura, & Watanabe, 2002).

In the different case studied houses, the inhabitants answered that there is a lack of green areas where most of residents prefer to have such areas. However, the reasons for this scarcity of green spaces and trees are different in each case. For collective houses and self-build houses the main blame falls on the residents as there are enough places designated to be planted but the initiative is not made. For self-build houses residents can choose to reserve or leave an area for a garden.

### 6.3.3 Children playgrounds.

#### a) Collective houses.

The majority of respondents in the three estates claimed that there are no play areas and the children are playing in car parks and non-designated areas between blocks (Figure 6.24). Some families in Mezghitane estate don't allow their children to play outside, a female respondent stated: "My children are playing in the house; I can't let them go outside because it is unsecure. Sometimes we take them to the zoo which takes twenty minutes by car".

A)



B)



**Figure 6.24: Children playing in streets, car parks and non-arranged areas in: A) Mezghitane and B) 400 houses site.**

Figure 6.25 shows destroyed children's playground in the 375 houses estate, this image can be seen in many other collective housing estates in the city of Jijel. Residents are the only ones who can be blamed for such behaviour and government should perhaps punish and penalise those responsible for destroying public places.



**Figure 6.25: Destroyed and unmaintained children's playground in 375 houses estate.**

**b) Self-Build houses.**

All the respondents assumed that there is no play area and their children are playing in roads next to their houses.



**Figure 6.26: Children playing in unarranged and unsecure areas**

**c) Courtyard houses of Souika.**

The vast majority of respondents (75%) from Souika claimed that there are no play areas and the children are playing in wast Eddar (Courtyard) or near the house (Figure 6.27). This is always due to the lack of space caused by the density of the urban fabric.

A female respondent said: "Children are playing in courtyards and in alleyways near the houses which created a lot of noise during the days".



**Figure 6.27: Children playing near the house.**

	Estates				
	Mezghitane	400 houses	375 houses	Self-Build	Souika
No.....	80 %	70%	80%	100%	75%
Yes.....	20 %	30%	20%	0	25%
Column total.....	100%	100%	100%	100%	100%

**Table 6.1: Inhabitants' perception of children playgrounds in each estate.**

**6.3.3.1 Discussion.**

Children playgrounds and their accessibility both in central and peripheral neighbourhoods are important features in children's daily lives (Ferre, Guitart, & Ferret, 2006). Public spaces and playgrounds have been considered as laboratories where children play and learn. Child psychologists, anthropologists, sociologists, geographers, and urban planners have highlighted the value of public spaces for the physical activities and social development of young people (Loukaitou-Sideris, 2003).

Unfortunately, all the different studied estates lacked areas for children to play. This is the image of all residential estates in the city of Jijel where children are playing in unsecure places such as roads and car parks. However, the government and planning services are not the only part that should be blamed; residents also take an important role in this; where existing children playgrounds in the example of promotional houses have been falling into disrepair or destroyed.

In this context, safe and comfortable playgrounds should be provided in each neighbourhood and the age and the gender of children should be considered (Ferre et al., 2006).

### 6.3.4 Squares and gathering areas.

#### a) Collective houses.

The majority of respondents considered that there are no squares or areas where residents and neighbours can gather. When asked if they preferred having such areas, 100% of the residents in Mezghitane agreed and 80% in both 400 houses estate and 375 houses estate. The remaining 20% in the two estates represented responses from women; they preferred not to have such areas close to their houses in order to have better privacy to use balconies.

#### b) Self-Build houses.

Nearly all respondents (90%) consider that there are no squares or areas where residents and neighbours can gather; whereas all of them prefer to have such areas.

#### c) Souika.

All the respondents in Souika considered that there are no squares or areas where residents and neighbours can gather. When asked if they preferred having such areas: 87.5% of the residents said yes. The remaining 12.5% prefer not to have such areas close to their houses because they consider that there are many squares in the periphery of the quarter.

#### 6.3.4.1 Discussion.



**Figure 6.28: Perception of the inhabitants on the presence of squares and groupement areas in the estates.**

- Residents' preferences.

	Estates				
	Mezghitane	400 houses	375 houses	Self-Build	Souika
<b>No.....</b>	0 %	20%	20%	100%	87.5%
<b>Yes.....</b>	100 %	80%	80%	0	12.5%
<b>Column total...</b>	100%	100%	100%	100%	100%

**Table 6.2: inhabitant's preferences towards the presence of squares in the estate.**

In the contemporary urbanized world, creating a living environment that produces local social life is becoming more and more essential (Mantey, 2017). Well-planned and developed public spaces produce socially desirable behaviour and attitudes and promote social interaction between individuals with different interests and different backgrounds (Rostami, Lamit, Khoshnava, & Rostami, 2016).

In all the studied cases there are no squares or areas where residents and neighbours can gather. In the case of collective houses; there is enough space to be arranged but not very close to the blocks. However; in the case of self-build houses there is not enough space to create such arrangements nor much encouragement. Also; in the case of the medina of Constantine the problem is caused by the density of buildings.

Public places are the important components of the city that generally impacted the quality of the local environment by their physical and ecological roles in addition to the contribution to both mental and psychological health of people in different forms (Rostami et al., 2016). One of the main outcomes of the UN Habitat new urban agenda for the next two decades about urban planning and design is to highlight the provision of public places in terms of responsiveness and inclusiveness (Moulay, Ujang, Maulan, & Ismail, 2018).

Hence, it is important to provide urban master plans by public places and squares where people can be grouped, these places should be well located in relation to people's everyday routes in order to encourage people to use them (Rostami et al., 2016).

### 6.3.5 Security.

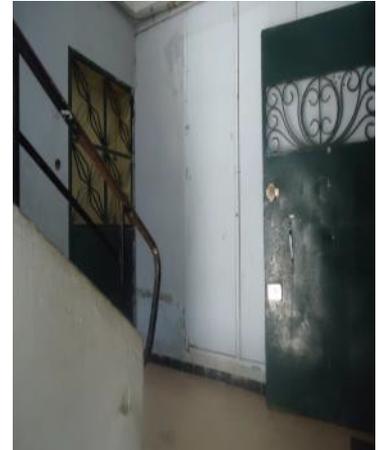
#### a) Collective houses.

A modest number of interviewees (20%) in the two social sites (400 houses estate and Mezghitane estate) said that there was a concern about burglary/stealing in their blocks in comparison to the promotional site (375 houses estate) when more than half respondents indicated a concern in their blocks. However, the majority of respondents in the three sites have taken security measures in order to protect their houses from such behaviours. These measures can be seen in metal doors and windows grids particularly on the ground floors and also the main metal door of the block which is closed at night (Figure 6.29).

A)



B)



C)



**Figure 6.29: Security Measures - Iron grids and iron doors in: A) Mezghitane, B) 400 houses and C) 375 houses estate.**

**b) Self-Build houses.**

A small number of interviewees (only 30%) said that there was a concern about burglary of their houses and 30% of them stated that there was a concern for security within the estates. However, half of respondents have taken measures of security in order to protect their houses; these measures can be seen in the metal doors and metal windows grilles particularly on the ground floors (Figure 6.30).



**Figure 6.30: Iron doors and Iron windows.**

**c) Souika.**

Just a small number of interviewees (only 25%) in Souika said that there was a concern about burglary of their houses. These are multifamily houses when the external doors are not closed until the night. Also, only 12.5% of residents stated that there was a concern for security within their surroundings. However, half of respondents have taken measures of security in order to protect their houses; these measures are generally metal grilles on windows (Figure 6.31).

A male respondent stated: "We all know each other, only merchants are strangers here. We don't have any security issues".

A)



B)



**Figure 6.31: Security Measures - Iron grids: A) Interior facades and B) Exterior facades.**

### **6.3.5.1 Discussion.**

Security do not seem to be a major problem in all studied sites where only a small proportion had a concern about burglary/stealing of their household possessions or intruders in their surroundings. However, residents expressed some concern by adding iron grids to their windows and metal doors for their dwelling entrance door particularly on the ground floors.

### **6.4 Conclusion.**

This chapter presented the evaluation of the inhabitants of their house environment. It has first included a general presentation of the different case studies: the three collective houses estates, self-built houses in Jijel and the courtyard houses in the quarter of Souika in the city of Constantine. The second part presented the residents' evaluation of their house environment. This included: the availability and distance from different amenities and services, the presence of green areas, children playgrounds and squares. Finally, the levels of security and measures undertaken by residents have been evaluated. The main results are:

The exterior environment and the existence of different amenities and services needed in daily life have affected the satisfaction of residents. The different case studies excluding Mezghitane estate are well located and have access to different services and facilities which created a comfortable living environment and resulted to a good level of residents' satisfaction of their houses environments. In Mezghitane estate, the lack of services and necessary public amenities created some difficulties and an uncomfortable living environment for residents. This is an image of the failure of housing policy in Algeria that was discussed in chapter 3 of this thesis. The delay in the completion working time of housing and different public projects has negatively impacted the way those houses are delivered before providing the minimum of needed services even public transport whereas all new agglomerations are planned within all necessary public amenities and facilities.

In the different case studied houses, the inhabitants claim from the scarcity of trees and green areas and most of them prefer to have such areas. However, residents when they had a choice to reserve an area for a garden such as the inhabitants of self-Built houses they built the total area of the plot instead. Also, in collective houses there are enough places designated to be planted but the initiative is not made only in some blocks where residents of the ground floors enclosed the area surrounding their apartment which add some aesthetic to the estate and privacy to the house. This act is not permitted by local authorities despite its environmental benefit for the estate. Consequently, the municipality or housing developers should encourage such behaviours by organising and sharing the responsibilities between residents.

All the different case studies excluding 375 promotional houses estate lacked arranged children playgrounds despite their important role in social and physical development of young people.

In the promotional houses estate, existing children playgrounds have been falling into disrepair or destroyed. In this case, the only part that could blame is residents.

In this context, government and urbane services should provide well-planned, safe and comfortable playgrounds in each neighbourhood and the age and the gender of children should be considered. Also, financial penalties should be applied for any act of vandalism to such public places.

In all studied cases there are no arranged public places, squares or areas where residents and neighbours can gather. Such places if well-planned and well-arranged would encourage social interaction between neighbours. Consequently, urban master plans should be provided by public places and squares that should be well located in relation to people's everyday routes and not enface of houses balconies in order to not limit their use by women.

With regard to security, it does not seem to be a major problem in all studied sites where only a small proportion had a concern about burglary/stealing of their household possessions or intruders in their surroundings. However, residents expressed some concern by adding iron grids to their windows and metal doors for their dwelling entrance door particularly on the ground floors.

The comparison of the different features of the housing environment has resulted that even in the promotional estate where the prices of houses are much higher and cannot be compared to the other case studies, the state or urban services don't give any consideration to the choice/location of the site and the provision of public places, green areas and children playgrounds.

The next chapter 7 presents the residents' evaluation to spatial comfort in their houses.

## **Chapter 7: Residents' Evaluation of Spatial Comfort in their Houses.**

## 7.1 Introduction.

Indoor conditions have serious impacts on people's health, comfort and well-being as they spend nearly 90% of their time indoor and more than half this time is spent in homes. Consequently, it is crucial to study the factors that influence their comfort (Frontczak, Andersen, & Wargocki, 2012).

The new housing design in Algeria has been criticized to be adapted from European standards with total neglect to local needs and cultures. Indeed, new dwellings are considered not totally suitable for the majority of Algerian families even with the social changes taking place in terms of family size and space use pattern (Behloul, 1991).

This part of the thesis is related to the assessment of the extent to which the size of the different types of houses (Collective apartments, Self-build houses and courtyard houses) also the size and the shape of the different living areas in the dwellings are appropriate to the residents' needs.

The data used in this chapter consists of residents' answers to direct questions about their perception of the spatial organisation of their dwellings, their preferences, the size and the shape of the different spaces within their houses as well as the activities that are carried out in the different spaces. The results are supported by photographic records and are followed by a discussion of each topic.

### 7.1.1 Households' structure.

#### a) Collective houses.

The analysis of the inhabitants' answers of the three studied estates shows that 100% of households are nuclear.

Mezghitane estate and 400 houses estates are mainly occupied by families of 3-4 people while only 40% of households in 375 are of 3-4 members and 60% are of 5-8 people.

#### b) Self- Build houses.

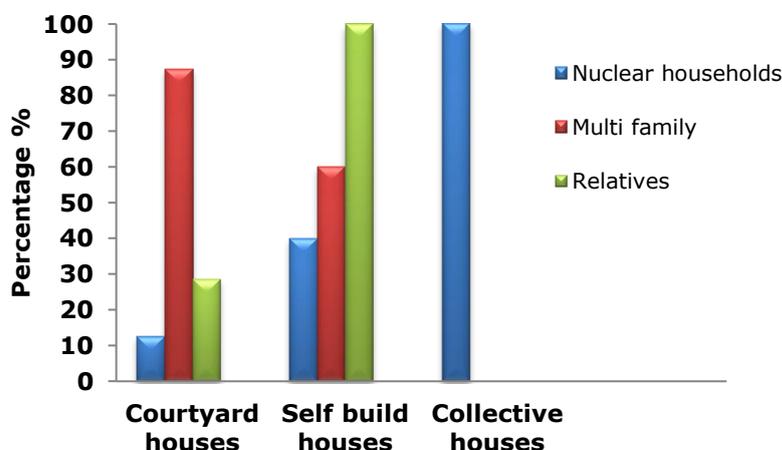
In the ten studied houses, 40% of households are nuclear and the remaining is multi-family. The percentage of occupants by family is represented in Figure 7.1.

#### c) Courtyard houses.

In the studied cases, 87.5% (7 out of 8) of the houses are occupied by multiple households with 28.57% of occupants being relatives from the same family and the remaining 71.43% of them are unrelated (originally strangers) renting in same house.

A female respondent who is sharing the house with her brothers in law families said: " I want to move from here to an apartment, even a garage is much better than living between these daily family problems".

#### 7.1.1.1 Discussion.



**Figure 7.1: Classification by type of household of courtyard houses in Constantine, self-build houses and collective houses in Jijel.**

The courtyard houses analysed in the city of Constantine are occupied by multiple households with a small number of occupants being relatives from the same family but the vast majority of them being unrelated (originally strangers) renting in the same house. By comparison, 60% of self-build houses are occupied by families that belonging to the same overall family clan, while collective houses are mostly occupied by nuclear families. This could reflect a certain level of social comfort in collective houses and self-build houses in comparison to the courtyard houses.

### 7.1.2 Housing ownership.

#### a) Collective houses.

The majority of people in the three estates are the owners. The small difference between the estates may be explained by the different acquisition modes of the apartments. In the 375 houses estate 100% of the interviewees are the owners as promotional apartments they should be totally paid before the acquisition of the house. Also, social participatory houses of Mezghitane estate should be fully paid – the survey shows that 70% are the owners and the remaining 30% are renting privately. In the 400 houses estate the residents should pay the rent to the council for at least 20 years from the acquisition; then they have the choice between paying the remaining amount of the price and have the ownership of the apartment or continue paying the rent to the council which explain the 30% renting from council.

#### b) Self- Build houses.

All the case studied houses have a shared family ownership. When in majority of cases the father is the owner and his married sons are living in separate apartments.

#### c) Courtyard houses.

37.5 % of the interviewed residents in Souika are the owners, only 12.5% of them are renting from the council and these houses have been rehabilitated. The remaining 37.5% are renting from private landlords (Figures 7.2). Residents in this category live in very bad conditions and the majority of 66.66% of them are renting just one room for a whole family. For example, a case study household is consisted of 6 people, shared a toilet with other 6 households and don't even have a kitchen and bathroom (Figure 7.3).



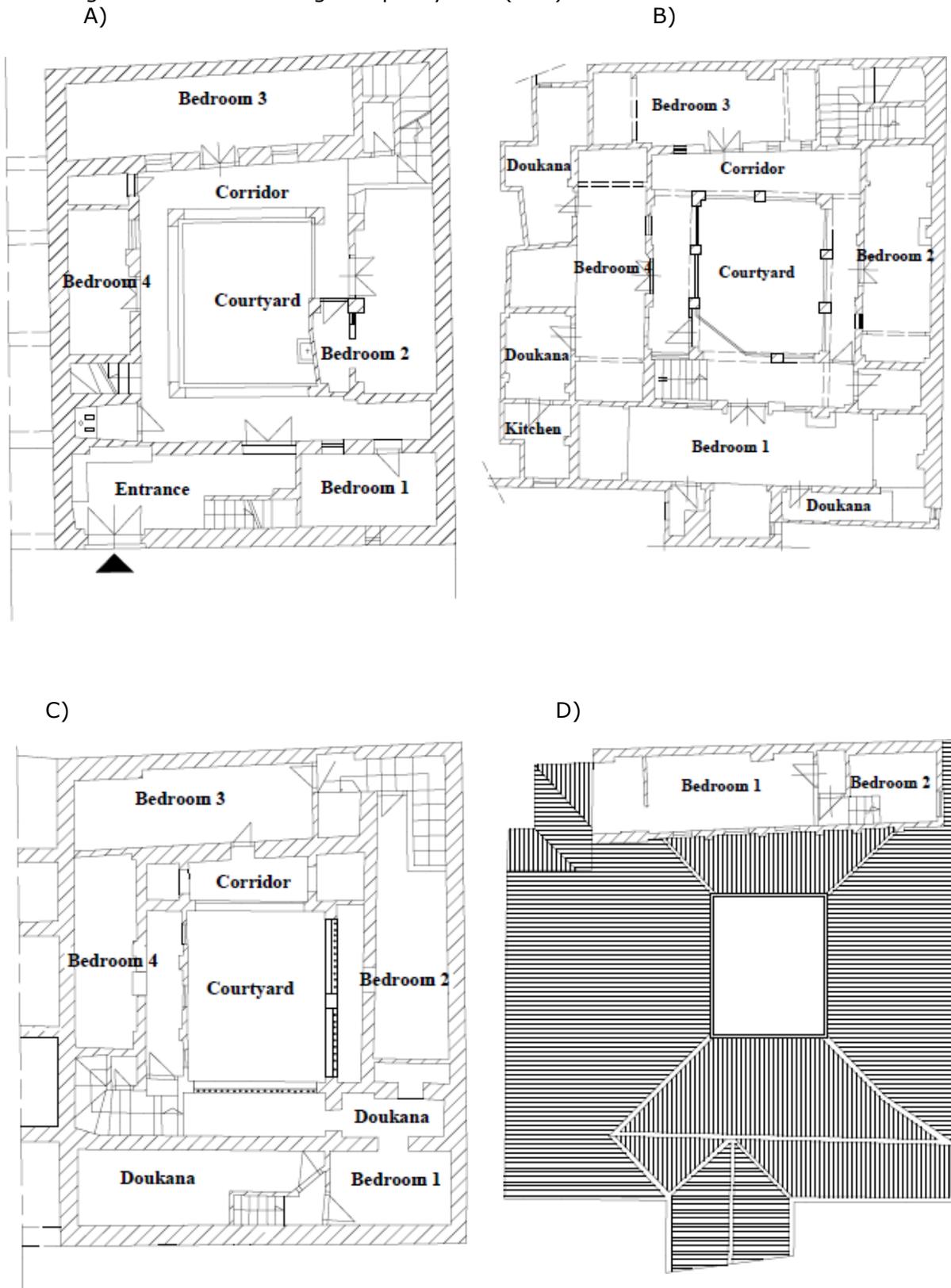
Figure 7.2: Examples of rehabilitated houses in Souika.



Figure 7.3: A case study house with a shared toilet.

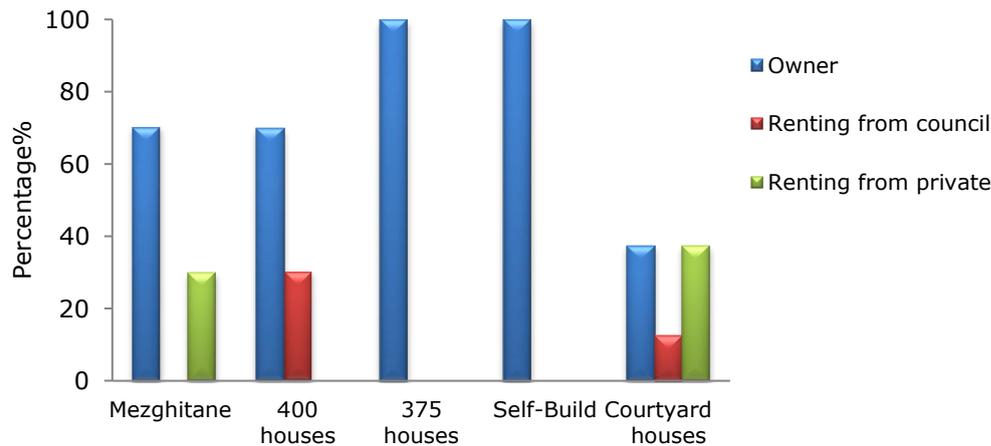
Below is an example of a case studied house (Figure 7.4) which is occupied by 73 people from 10 different households divided into 14 rooms in total living area of 224,15m<sup>2</sup>. This

resulted to a room occupancy rate of 5.21 which is much higher from the national rate and even higher than the dwelling occupancy rate (TOL).



**Figure 7.4: Example of present occupation of courtyard houses in Souika: A) Ground floor, B) First floor, C) Second floor & D) Top floor (Source: URBACO).**

### 7.1.2.1 Discussion.



**Figure 7.5: Housing ownership.**

Home ownership has become an essential feature of individual's wealth as it is regarded as a real estate and a place for residence. Owning a home can provide financial security and indirect income to the owner. Consequently, home can be considered as a form of wealth that can be an alternative old-age pension (Yuan, He, & Kim, 2017).

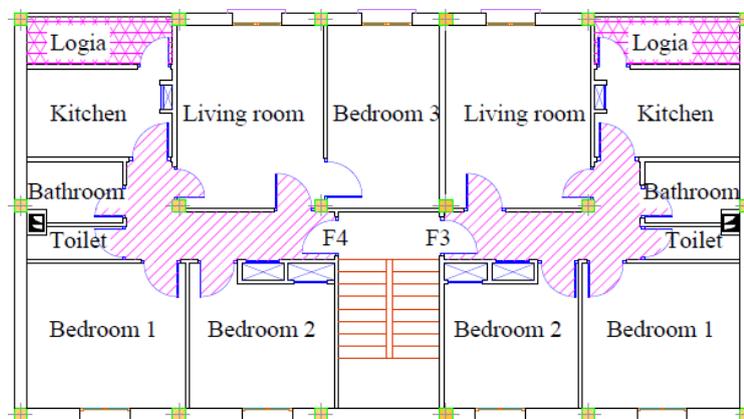
It has been shown that mainly all the interviewed residents are the owners of their apartments in collective houses. Also, all self-build houses have a shared family ownership where in majority of cases the father is the owner and his married sons are living in separate apartments. This can reflect a good level of comfort which cannot be found in traditional courtyard houses in Souika where the majority of dwellings are overcrowded and rented by many non-related families that shared the semi-public places in the house such as the courtyard and even the toilet in some cases.

### 7.1.3 Dwelling organisation preferences.

#### a) Collective houses.

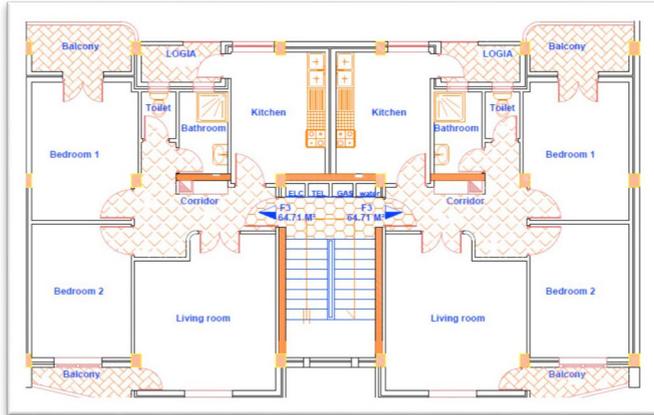
The vast majority of respondents in the three estates (80% in Mezghitane and 70% in both 400 houses and 375 houses estates) prefer to have an organisation around a central space rather than a corridor. They justify their answers that this organisation provides more space, better air circulation and more accessibility to the other parts of the house.

A women respondent in Mezghitane estate stated: " I prefer a central court which is useful for traditional activities such as: washing carpets, washing the wool which is used in making mattresses and to gorge the sheep of Aid".



**Figure 7.6: Spatial organisation of the apartments in 400 Houses estate.**

A)



B)

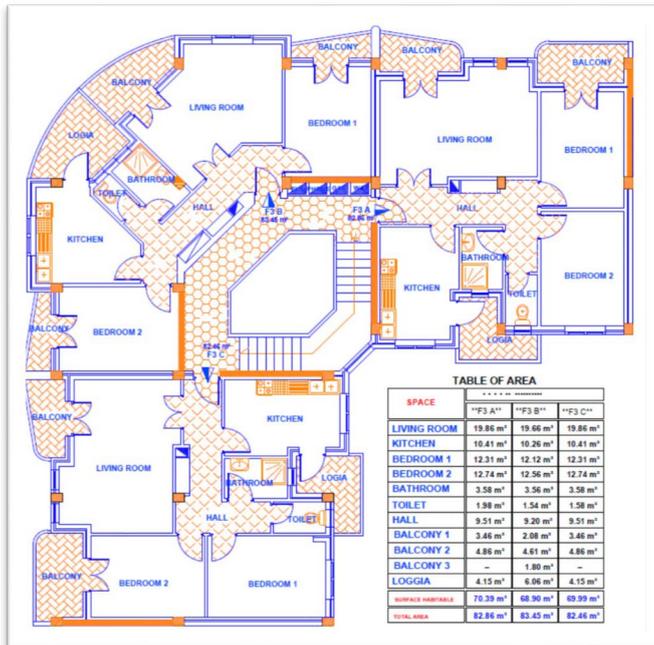


Figure 7.7: Spatial organisation of the apartments in Mezghitane estate: A) Bar block & B) Angle block.

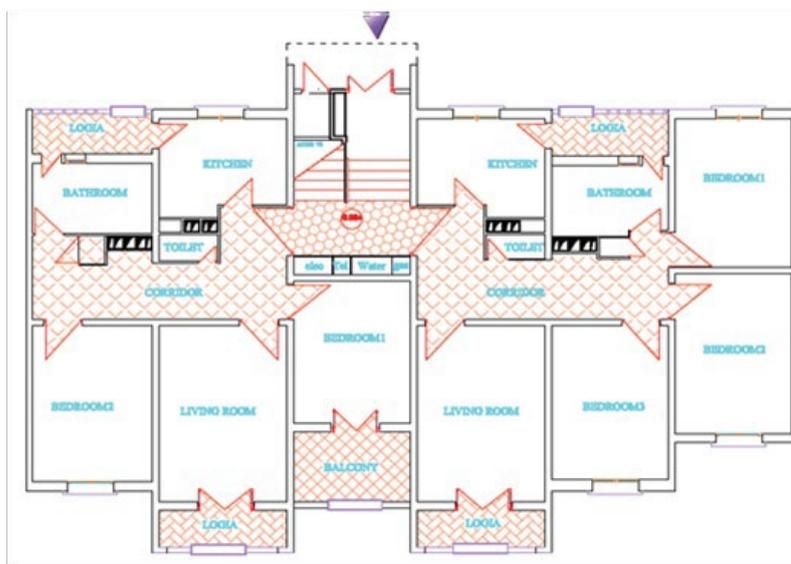


Figure 7.8: Spatial organisation of the apartments in 375 Houses estate.

**b) Self-Build houses.**

The vast majority of respondents in the case studied houses prefer to have an organisation around an internal central area rather than a corridor; they justify their answers that this organisation provides more space area, better air circulation and more accessibility to the other parts of the house. The other 20% prefer the corridor than an opened court due to difficulty to get a thermal comfort in winter.

A female respondent who answered that she prefer the corridor said: "Honestly, I like the house organised around a court but it is difficult to get thermal comfort in winter despite the presence of a heating system"

Most of the interviewees have a central or peripheral court or patio designed in order to get light and air to some parts of the dwelling, in most cases for the bathrooms and kitchens. Figure 7.9 and 7.10 show the use of a hall and corridor.

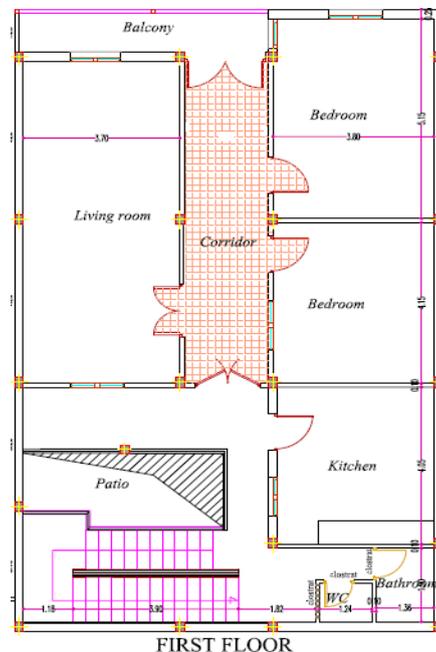


**Figure 7.9: A hall serves as a sitting area for family gathering.**



**Figure 7.10: A corridor serves the both sides of the house.**

Figure 7.11 shows the plan of an interviewed self-build house with a peripheral patio.

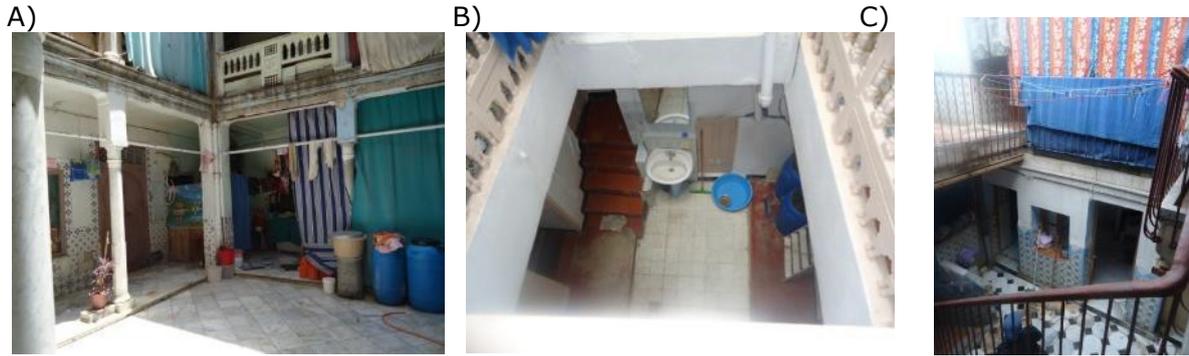


**Figure 7.11: Plan of a house with a peripheral patio.**

**c) Souika.**

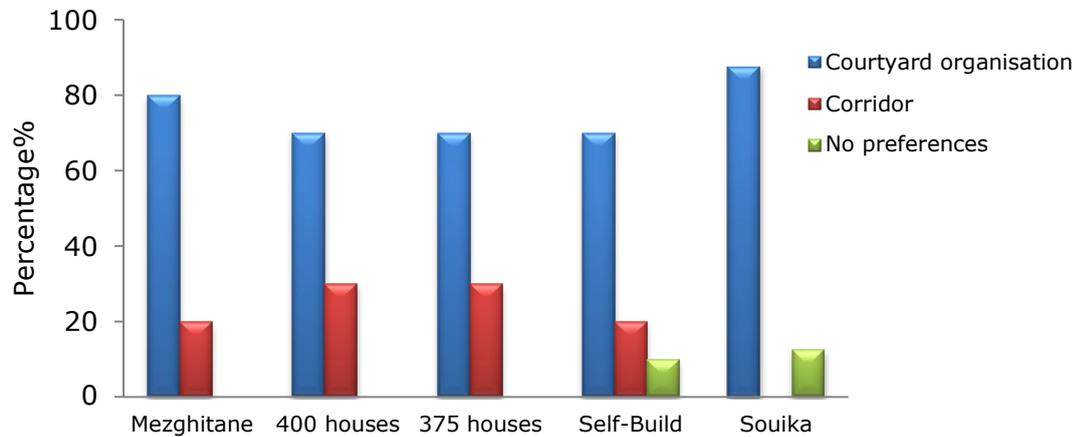
The vast majority of respondents in the case studied houses (87.5%) prefer to have an organisation around a central space or a courtyard rather than a corridor. They justify their answers by the fact that they are accustomed to this type of organisation. Also, the courtyard provides more space for family gathering and social events such as weddings.

A respondent said: " All our daily activities are run in the courtyard; washing and drying the clothes, cooking, and we all gather here in occasions. Also, we can have here contact with solar radiation and fresh air".



**Figure 7.12: The use of courtyards in: A) Multifamily house. B) & C) Nuclear households.**

### 7.1.3.1 Discussion.



**Figure 7.13: Inhabitants' preferences to housing organisation.**

The vast majority of respondents prefer to have an organisation around a central space or a courtyard rather than a corridor. Respondents in different studied sites tended to give the same reasons such as providing more space, better air circulation and more accessibility to the other parts of the house; though a small difference exists with residents of courtyard houses who are accustomed to this type of organisation.

A small number of interviewees prefer the corridor due to the difficulty to control thermal comfort in a courtyard particularly in winter. Therefore, in order to benefit from the positive role of the courtyard, an opened covered area can replace the traditional form of the courtyard. It is true that in the new form of Promotional assisted houses- LPA (which was presented in chapter 3 of this thesis), it is highly recommended to provide a hall rather than a corridor in the entrance of the house but this recommendation is not always followed by architects.

### 7.1.4 Size of the house.

#### a) Collective houses.

In the two social estates (Mezghitane estate and 400 houses estate), the majority of respondents (70%) find the size of their apartments too small for their family needs and all of them prefer to have one or two extra rooms to be used as a room for children and a dining room.

Interestingly, 60% of respondents in the third estate (375 houses) consider that the apartments are of the right size for their family needs, 20% of them stated that the

apartment is big and only 20% consider their apartment small. Just 20% of the respondents desire to have an extra room to receive guests.

**b) Self-Build houses.**

The vast majority of respondents in the studied houses find the size of their houses large and have the right size in comparison to their family needs. Just 10% of respondents answer that their houses are small and some of them (20%) prefer to have one extra room to be used as a visitor's room.

Table 7.1 shows the number of rooms in self-build houses. Residents that have four and five rooms are more satisfied than the others that have three rooms.

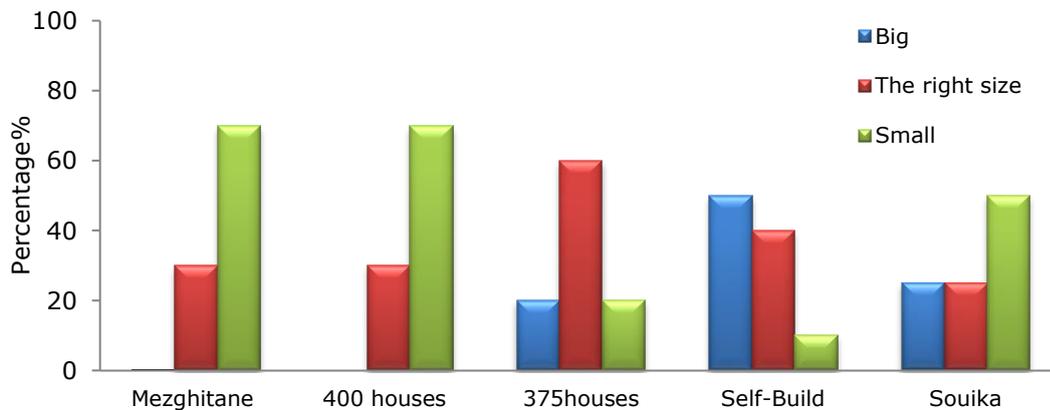
	Number of rooms.		
	3 rooms	4 rooms	5 rooms
Percentage	30%	40%	30%

**Table 7.1: Residents satisfaction of the number of rooms in their house.**

**c) Souika.**

In the studied houses, half of respondents find the size of their houses too small for their family needs (Figure 7.9) because there are many households' sharing the same house. These families desire to have extra rooms but they have to pay a more expensive rent to the landlord. 25% of the respondents find their houses of the right size and these are mainly nuclear families. The remaining 25% found the houses big before rehabilitation but now the house became smaller. They also stated that the rehabilitation took place without consultation with them about their preferences since they are not the owners of the houses, even though they have been renting from council for many years, some even before the independence of the country in 1962.

**7.1.4.1 Discussion.**



**Figure 7.14: Inhabitants' evaluation of the size of their house.**

Estates	Living area (m <sup>2</sup> )			
	2 bedrooms		3 bedrooms	4 bedrooms
<b>Mezghitane</b>	70.4	68.5	70	-
<b>400 houses</b>	65.2		76.7	88.2
<b>375 houses</b>	68.7		81	93.4
<b>An example of Self-Build House</b>	151 (04 people)			
<b>An example in Souika.</b>	224,15 (73 people)			

**Table 7.2: Total living areas of the houses.**

The residents' perception on the size of their houses depends on household's size in comparison to the number of rooms in the house.

In collective housing estates, residents of promotional estates are more satisfied by the size of their apartments even though the total living area is close to the areas of the apartments

in the other estates. The comparison has shown that people are more concerned by the number of rooms provided than by a bigger area.

In the case of traditional courtyard houses, the majority of households are not satisfied by the size of their dwellings despite the total built area which is considered big. The number of households sharing the same house especially when they are strangers has negatively influenced their feeling of comfort. Also, the rehabilitation of some houses has taken place without consultation with potential occupants as they are renting from council; this fact had led to a high level of dissatisfaction of the inhabitants.

The results have shown that the occupants of self-build houses are more satisfied by the size of their houses as they are built according to their family needs and just a small proportion of them desire to have an extra room for visitors.

### 7.1.5 Size of the living rooms.

#### a) Collective Houses.

70% and 100% of respondents from Mezghitane and 400 houses estates respectively find the size of the living room small and all of them find the shape inconvenient to accommodate their furniture.

In the 375 houses estates, 50% of respondents find the size of the living room small and the other half find it about the right size. However, 70% of respondents find the shape inconvenient to arrange the furniture. Figure 7.15 shows a living room arranged in Mezghitane.



Figure 7.15: Arranged living room in Mezghitane estate.

#### b) Self-Build Houses.

The vast majority (70%) of residents of self-build houses find the size of the living room big and the remaining 30% find it the right size. All of them find the shape suitable to arrange the furniture. Also, all the houses have a separate dining room in addition to the living room. Figure 7.16 shows furnished living rooms with large area to circulate.



Figure 7.16: Furnished living rooms with large area to circulate.

#### c) Courtyard Houses.

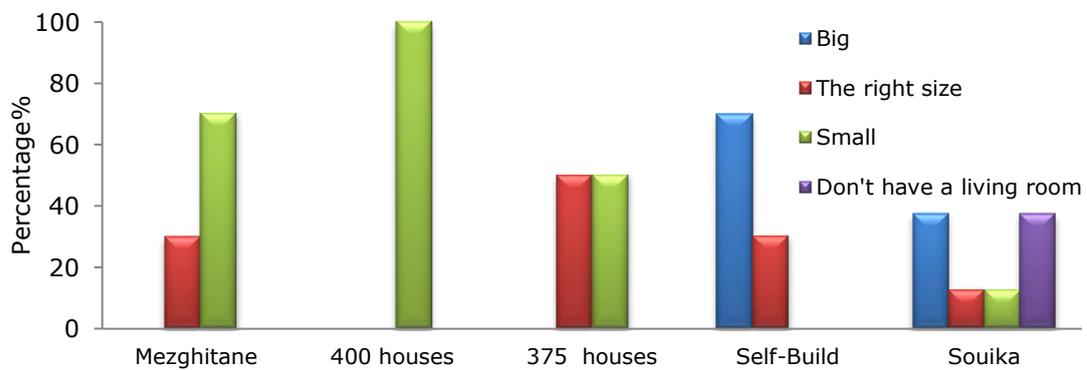
37.5% of respondents find the size of the living room (or Madjelis) to be big. In some houses, there was an additional space called Maqsourat (Figure 7.17). 12.5% of respondents considered that their living rooms have the right size while another 12.5% said that the living room is too small. The remaining 37.5% don't even have a living room.



**Figure 7.17: Big living room provided by Maqsourat.**

All respondents find the shape inconvenient in terms of accommodating the furniture because in most cases the room is too long and narrow.

**7.1.5.1 Discussion.**



**Figure 7.18: Residents' evaluation of the size of the living room.**

Estates	Living area (m <sup>2</sup> )		
	F3	F4	F5
<b>Mezghitane</b>	19.70	-	-
<b>400 houses</b>	15	15	15
<b>375 houses</b>	17	17	17
<b>Example of Self-Build houses</b>	30		
<b>Example of Souika</b>	17.50		

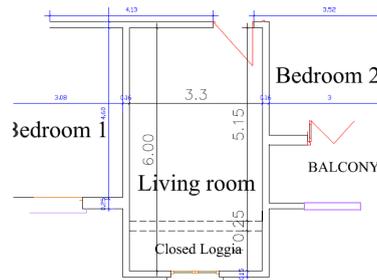
**Table 7.3: Surface area of the living rooms.**

The vast majority of respondents of collective apartments are not satisfied by the size of the living room and find it too small. Also, they find the shape inconvenient to arrange the furniture and most residents close the loggias in order to gain more living area in the living room. Even in the promotional estate where the area of the living room is smaller than the area fixed by the Algerian regulations for social rented housing which is 18m<sup>2</sup> (MHUV, 2012).

A)



B)



**Figure 7.19: Example of modifications made in order to gain more space to the living room: A) 400 houses & 375 houses.**

However, the vast majority of residents of self-build houses are satisfied by the size of the living room and they find the overall size large enough. Also, all of the respondents consider the shape suitable to arrange the furniture. In addition, all the houses have an extra separate dining room.

In the case of courtyard houses, many households are satisfied by the size of their living rooms and they even have an additional space attached to it. However, in the case of houses shared by non-relatives many of them don't even have a living room.

From table 7.2, living rooms with total area of 30 m<sup>2</sup> is considered large and 19.70 m<sup>2</sup> is considered at 70% small. Thus, 25m<sup>2</sup> can be regarded as have the right size.

### 7.1.6 The size of bedrooms.

#### a) Collective Houses.

In the two social estates nearly all respondents (90% in 400 houses and 100% in Mezghitane estate) find the size of the bedrooms small and they cannot arrange the furniture in the way they want. In some cases they had to swap between the bedrooms and the living room in order to get more space for the children's room (Figure 7.20) or to get more space in order to arrange the furniture in the parents room (Figure 7.21).

A)



B)



**Figure 7.20: : Bedroom transferred to a living room (A) and the living room to a children's room (B) in the 400 houses estate.**

A)



B)



**Figure 7.21: Bedroom transferred to a living room (A) and the living room to parents' room (B) in Mezghitane estate.**

Conversely, in 375 houses estate 70% of respondents claimed that the size of the bedrooms is the right size and they can arrange the furniture in the way they want.

When residents of the three collective estates were asked if there are any other activities they cannot do in their houses because there is not enough space (Table 7.3). In Mezghitane estate, the number is more significant than the other estates (70% in Mezghitane versus 40% in 400 houses and 375 houses estate) which means that residents in 400 houses and 375 houses estates are more satisfied in terms of space and this can be only related to the number of bedrooms.

	Estates		
	Mezghitane	400 houses	375 housing
<b>No.....</b>	30 %	60%	60%
<b>Yes.....</b>	70 %	40%	40%
<b>Column total.....</b>	100%	100%	100%

**Table 7.4: Inhabitants' satisfaction to their houses.**

Some respondents answer that they cannot practice sport, gathering families during social and religious occasions and receiving guests.

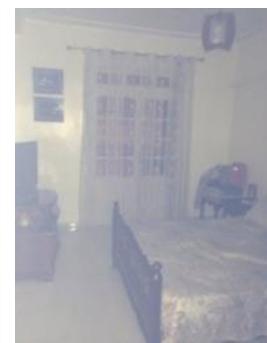
**b) Self-Build Houses.**

More than half respondents (60%) find the size of their rooms big the rest 40% find the rooms have the right size comparing to their family needs. All the respondents can arrange the furniture in the way they want.

All residents of self-build houses assume that they can do whatever they want in their houses and the space have never been a problem or an obstacle (Figure 7.22 & 7.23).



**Figure 7.22: Children bedrooms with male and female segregation.**



**Figure 7.23: Parents bedrooms with enough space to arrange furniture.**

**c) Souika.**

The vast majority of respondents (75%) find the size of the bedrooms too small and they cannot arrange the furniture in the way they want. The remaining 25% stated that the rooms are of the right size.

When residents were asked if there is any other activities are held in bedrooms, a significant number of 62.5% of respondents stated that the majority of their daily activities (even eating) are held in bedrooms.

Also, when they were asked if there are any other activities they cannot do in their houses due to the lack of space, a significant number (87.5%) agreed. Some residents stated that they cannot buy or arrange the furniture the way they want, there is no space for drying clothes and that they are not able to have guests around.

In some cases bedrooms are just separated by curtains in order to gain some privacy especially for male and female separation (Figure 7.24).



Figure 7.24: Bedrooms separated by curtains.

### 7.1.6.1 Discussion.

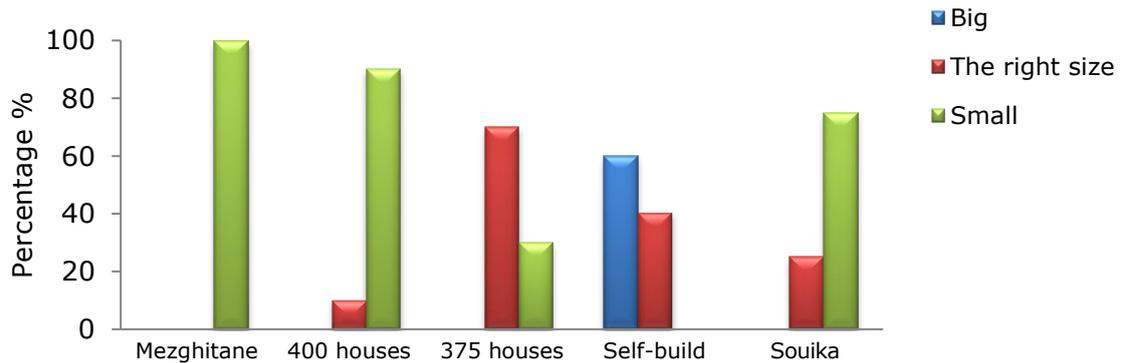
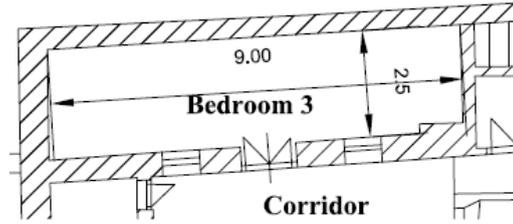


Figure 7.25 : Inhabitants' evaluation to the size of bedrooms.

Table 7.4 below shows that the areas of bedrooms in the collective houses estates are very close even with the promotional apartments. However, people in this site are more satisfied in terms of spatial comfort as they have a larger number of bedrooms. Residents of collective houses that have three or more bedrooms are more satisfied in terms of space than those who have just two bedrooms although the size of bedrooms is nearly the same in the different studied estates. Consequently, residents' satisfaction in terms of bedrooms size seems to be more related to the number of rooms rather than their living areas.

Residents of traditional courtyard houses of Souika claimed that their bedrooms were too small. Table 7.4 shows that the size of some bedrooms can attain 20 m<sup>2</sup> which is very large. However, this room is grouping 9 people male and female without any physical separation. Also, Residents stated that they cannot arrange the furniture the way they want. This is probably due to the shape of rooms that are rectangular and very narrow when the ratio between dimensions of the same room is very important and in some examples the length of the room can easily exceeds three times its width (Figure 7.26). Also, there is a wide range of furniture in the local market in European style whereas in the past there was just a traditional way of furnishing with mattresses all around the rooms with small table in the centre. This organisation would not take much space and it was suitable with people's lifestyle of the past.



**Figure 7.26: Example of a large room in a courtyard house in Souika.**

Residents of self-build houses are more satisfied than the other groups by the size and the number of rooms as they can do whatever they want in their house and the space has never been a problem or an obstacle.

Estates	Living area (m <sup>2</sup> )			
	Bedroom 1	Bedroom 2	Bedroom 3	Bedroom 4
<b>Mezghitane</b>	12.3	12.7	-	-
<b>400 houses</b>	12.25	13.3	11.5	11.5
<b>375 houses</b>	11.00	13.4	13.8	12.4
<b>Example of Self-Build houses</b>	17.50	16	14.50	
<b>Example of Souika</b>	9.50	11.70	16.98	20.74

**Table 7.5: Comparison of bedrooms surfaces in the three estates.**

It can be concluded that residents do not need larger areas of bedrooms but they want a greater number of bedrooms. The number of rooms should be proportional with the number and the gender of people in the same household. Bedrooms with area between 12 and 14 m<sup>2</sup> are considered to have the right size.

### 7.1.7 Size of the kitchen.

#### a) Collective Houses.

The vast majority of respondents in collective houses estates find the size of the kitchen small and they don't have enough space for work and to arrange different equipment. In some cases, residents in the three estates have to use bedrooms, corridors, bathrooms and balconies in order to place the rest of their electrical equipment.

Figure 7.28 shows samples of modified kitchens in Mezghitane estate; the initial arrangements of these kitchens were destroyed and then rebuilt according to the inhabitants needs. The reasons of the modifications according to the residents are mainly to gain more working space.





Figure 7.27: Modified kitchens in Mezghitane estate.

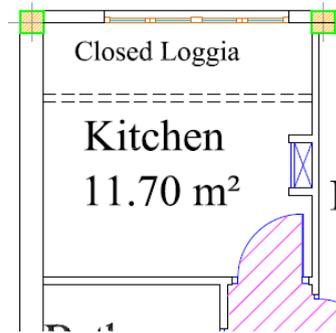
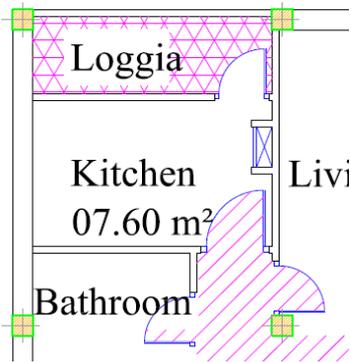


Figure 7.28: Modified kitchen in 400 houses estate.

**b) Self-Build Houses.**

The vast majority of respondents find the size of the kitchen big, the rest 30% consider it to have the right size and they have sufficient space for work and arrange different equipment. Figure 7.29 shows arranged kitchens.



Figure 7.29: Examples of arranged kitchens in self-build houses.

**c) Souika.**

Half of the respondents in Souika find the size of the kitchen too small and state that they don't have enough space for cooking. These kitchens are generally too small to accommodate equipment and in some cases, residents had to use bedrooms, corridor, bathroom and balconies in order to put the rest of their electrical equipment (Figure 7.30).



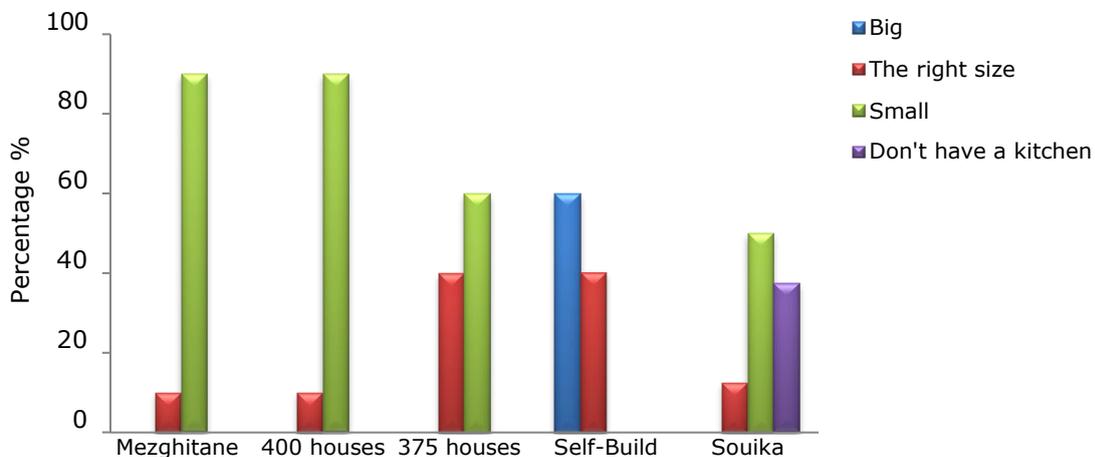
**Figure 7.30: A fridge in bedroom.**

Only 12.5% consider their kitchens of the right size. The remaining 37.5% don't even have a kitchen and they have to use corridors or courtyards to keep their appliances in sight of neighbours which leads to privacy and safety issues (Figure 7.31).



**Figure 7.31: A cooker used in the courtyard**

**7.1.7.1 Discussion.**



**Figure 7.32: Residents' evaluation to the size of the kitchen.**

Table 7.6 shows the area of the kitchen in the different case studies.

Estates	Area of kitchen (m <sup>2</sup> )		
	F3	F4	F5
<b>Mezghitane</b>	10.4	-	-
<b>400 houses</b>	07.6	07.6	07.6
<b>375 houses</b>	08.3	08.3	08.3
<b>Example of Self-Build houses</b>	15		
<b>Example of Souika</b>	05		

**Table 7.6: Area of the kitchen.**

The size of the kitchen is considered to be too small in the three collective estates and they have not enough space to arrange electrical equipment. Even in Mezghitane estate when the area is larger than the other sites equivalent to 10 m<sup>2</sup> as fixed by the government for Promotional Assisted Houses (LPA).

Also, residents that have a kitchen in Souika consider the size of the kitchen too small and they don't have enough space for cooking or to accommodate equipment.

However, residents of self-build houses are more satisfied by the size of their kitchens as they considered it big and they have sufficient space for work and arrange different equipment.

It can be concluded that the area of the kitchen should be more than 10 m<sup>2</sup> and less than 15 m<sup>2</sup> to be considered have the right size. It can be suggested that 12 m<sup>2</sup> would satisfy the needs of households.

### 7.1.8 Importance and use of the kitchen's loggia.

#### a) Collective houses.

The majority of apartments in the three estates have a loggia connected to the kitchen; some of them have been enclosed in order to gain more space for the kitchen (Figure 7.33).



**Figure 7.33: Closed loggia in 400 houses estate.**

Figure 7.34 shows one of the inconveniences of a closed loggia; the resident had to use the corridor to dry the clothes in rainy days.



**Figure 7.34: Drying the clothes in the corridor in a rainy day (closed loggia in 400 houses estate)**

The loggias are used as a storage space, a place to dry clothes, to put the water tank, washing machine, the fridge and tabouna, which is a cooker for traditional bread (Figure 7.35).



**Figure 7.35: The use of loggia in Mezghitane estate.**

**b) Self-build houses.**

Less than half respondents have a loggia but in a form of a court. They use it to dry clothes and the use of traditional cooker (Tabouna). The other respondents prefer not to have one because they have enough space in the kitchen.

**c) Souika.**

All courtyard houses don't have a loggia and half of the respondents prefer to have one in order to gain more space. The remaining 50% of the respondents prefer not to have one because they considered it useless since all the activities designated to be done in Loggia can easily be held in the courtyard. The latter is mainly used for drying clothes and water storage in barrels (Figure 7.36).

A)



B)



**Figure 7.36: The use of courtyards: A) Drying clothes. B) Water storage in barrels.**

Due to the topography of the Souika site, some houses are provided with basements which are used as storage places especially for household goods; but it is infrequently used (Figure 7.37).



**Figure 7.37: The use of the basement as a storage place.**

### **7.1.8.1 Discussion.**

Almost all collective apartments have a design in which a loggia is connected to the kitchen; however some of them have been enclosed in order to gain more space for the kitchen. The form of loggia is different in self-build house in a type of covered court. Some residents prefer not to have a loggia because they have enough space in the kitchen. The occupation of courtyard houses in the past had reduced the need for a loggia as all activities designated to be done there; such as drying clothes, water storage in barrels, washing carpets and other traditional activities was held in the courtyard. However, with the present occupation of non-related multi families the courtyard has lost its importance in the process of becoming a sort of a shared public space. This has increased the preference of having a loggia attached to the kitchen.

### **7.1.9 Balconies.**

#### **a) Collective houses.**

All the apartments in Mezghitane and 375 houses estates have balconies; they are used as an arrangement place and for drying clothes. But, in some cases the balcony is enclosed in order to get more space area for the living room (Figure 7.38).

A)



B)



**Figure 7.38: Balconies in: A) Mezghitane and B) 375 houses estate.**

In 400 houses estate none of the apartment have a balcony and all respondents would prefer to have one in order to dry clothes.

#### **b) Self-build houses.**

All the case studied houses have balconies; the majority of respondents are using them for drying clothes; some of them are using it for other reasons such as a space for children to play or for planting flowers and plants.

#### **c) Souika.**

None of the courtyard houses have balconies and only 25% of them have terraces that are used for sitting, drying clothes and storage places.

### **7.1.9.1 Discussion.**

The use of balconies and terraces is quite similar to the loggia; in collective apartments it is used as a storage place and for drying clothes. But, in some cases the balcony is enclosed in order to gain more space area for the living room. In self-build houses, all houses have balconies and they are used for drying clothes, a space for children to play or for planting flowers and plants. In general no courtyard houses have balconies but some of them have terraces that are used for sitting, drying clothes and storage places.

Consequently, the balcony is only preferred when the surface area of the house is already sufficient. Also, it can be replaced by other forms of storage place.

The present occupation (overcrowding and occupation by non-relatives in courtyard houses) mean that in addition to the impact of modern lifestyles of people that have changed the needs and expectation has now created a problem of spatial comfort that was not present in the past.

### **7.2 Conclusion.**

This chapter presented the evaluation of the inhabitants of spatial comfort in their dwellings. The main results are:

The comparison of the three collective housing estates has shown that spatial comfort is the most clearly different criteria between the studied social and promotional estates; although people in the promotional estate are more satisfied in terms of space than the others; they still want extra rooms to gain more comfort. On the other hand, thermal comfort is not considered in the design of houses.

Self-build houses satisfied the needs of inhabitants in terms of spatial comfort.

Courtyard houses do not reflect the level of comfort that was in the past. This is caused by the overcrowding of houses in addition to the occupation of dwellings by non-relatives multifamily. However, people are satisfied by their houses and attached to this traditional lifestyle as they are used to it. Therefore, people prefer to live in a courtyard house but without sharing it with strangers.

Living rooms with total area of 30 m<sup>2</sup> is considered large and 19.70 m<sup>2</sup> is considered small. So, 25 m<sup>2</sup> can be regarded as have the right size.

The number of rooms should be proportional with the number and the gender of people in the same household. Bedrooms with area between 12 and 14 m<sup>2</sup> are considered to have the right size.

The area of the kitchen should be more than 10 m<sup>2</sup> and less than 15 m<sup>2</sup> to be considered have the right size. It can be suggested that 12 m<sup>2</sup> would satisfy the needs of households.

It is important to provide an additional space for a covered loggia or balcony to be used for drying clothes and storage places. The area of such spaces should not be taken from the total living area but it should be designed to cover the exterior sidewalk

The next chapter 8 presents the environmental design issues and occupants reaction.

## **Chapter 8: Environmental Design Issues and Occupant Reaction.**

## **8.1 Introduction.**

Human's satisfaction and well-being are directly influenced by the built environment. Thus, it is important that buildings respond to residents' physical and psychological needs in order to give them a sense of self-worth, safety, and privacy. Physical satisfaction couldn't be achieved unless the human body is in a comfort level which depends on the compatibility of building design with outdoor climate (Soleymanpour, Parsaee, & Banaei, 2015). Moreover, good thermal comfort and air quality are related with productivity and performance (Zhao, Sun, & Tu, 2018).

In this context, this chapter is concerned by the investigation of the environmental design issues and occupant reaction.

The first part concerned the residents' evaluation of thermal comfort, daylighting and the comparison of water and energy consumption in different types of houses. Acoustic comfort, air quality and privacy have also been assessed in this section.

The second part of this chapter is related to the study of occupants' reaction to the design where their satisfaction and preferences into the design of their houses are been presented. The third part presented the main results of the surveys that were presented in previous chapter 7 and this chapter 8.

## **8.2 Environmental design issues.**

### **8.2.1 Thermal comfort.**

Thermal comfort is regarded as a crucial and a basic feature in the urban region (Djongyang, Tchinda, & Njomo, 2010). It has been considered as a physiological need and as a key parameter for healthy housing. It is also an important building design parameter, an energy efficiency standard and a cultural construct. The concepts of comfort have culturally developed and evolved over time but physiological thermal comfort has always been essential for human health and wellbeing (Watson & Watson, 2017).

#### **a) Collective houses.**

More than half respondents in the three estates answered that they feel comfortable in their houses in summer. However, in the 400 houses and 375 houses estates most respondents are using air conditioners which affect their feeling of comfort.

On the other hand, just 10% of respondents in Mezghitane estate are using air conditioners which make their feeling of comfort more attributable to the housing design.

In the Mezghitane estate, none of the interviewees stated that they feel comfortable in winter due to cold temperatures and the lack of natural gas to use heaters. This is contrary to the other two sites where nearly all respondents stated that they feel comfortable in their houses during winter but all of them are using heaters.

#### **b) Self-build houses.**

The vast majority of respondents answer that they feel comfortable in their houses in summer. However, more than half of them are using one or more air conditioners. More than half the interviewees are comfortable in their houses during winter. But all of them are using heaters.

#### **c) Souika.**

The vast majority (87.5%) of the respondents in Souika claim that they feel comfortable in their houses in the summer. It is noteworthy that 62.5% of them are using air conditioners which suggest they are unclear about their feeling of comfort.

Half of the interviewees don't feel comfortable in the winter, while the remaining 50% feel comfortable. However, the vast majority (87.5%) of respondents are using heaters and in some cases they had to install a heater in each room.



Figure 8.1: The use of heaters.



Figure 8.2: The use of air conditioners.

**8.2.1.1 Discussion.**

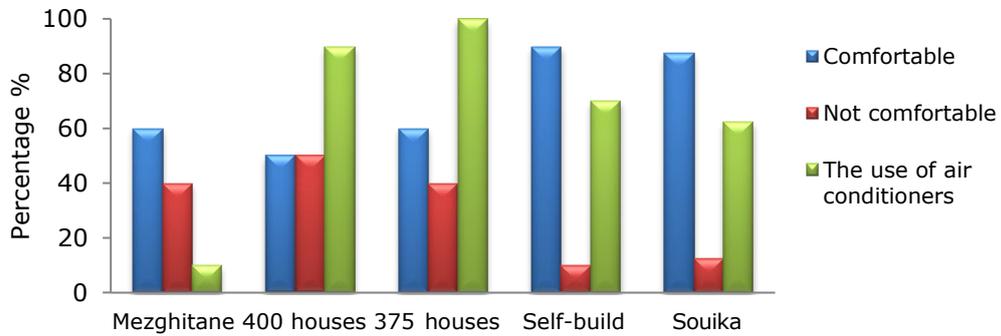


Figure 8.3: Inhabitants' estimation to their comfort in Summer.

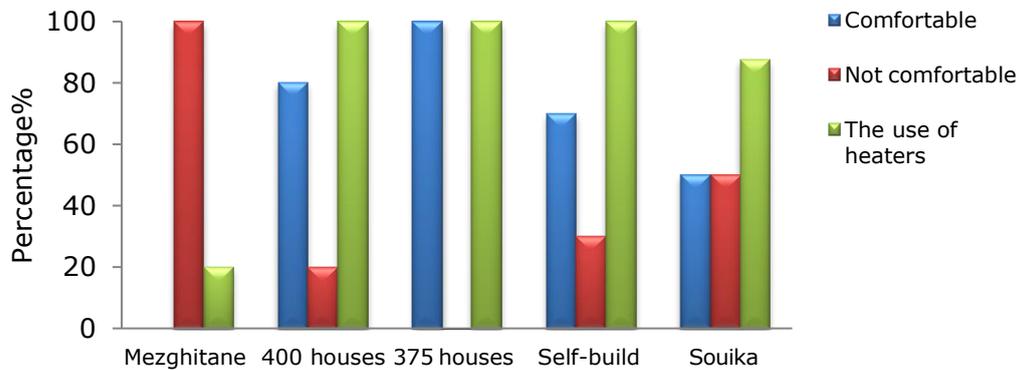


Figure 8.4: Inhabitants' estimation to their comfort in Winter.

The Mezghitane estate residents are more comfortable than residents of the other estates in summer due to the location of the site, the height and the proximity to the sea; however, in winter they suffer from cold due to the lack of fuel (natural gas) to use heaters: they have to buy bottles of butane gas which is more expensive and more difficult to obtain.

Thermal comfort in courtyard houses is related to the courtyard function; in summer the majority of residents feel comfortable but most of them are using air conditioners as they have to close the rooms' doors, reducing natural ventilation, in order to get some privacy due to multifamily occupation.

In winter, just half of them feel uncomfortable; however the vast majority of residents are using heaters and in some cases they had to install a heater in each room.

Thus, in comparison to the other studied sites; courtyard houses are more adapted to the climate through the integration of passive design techniques and the use of the courtyard design. Also, the use of thick stone walls plays an important role in insulation and thermal mass. The use of air conditioners and heaters is increased by the impact of occupation of the space by non-relatives; and also the need for more comfort.

Both collective houses and self-build houses are built without any respect to thermal comfort. Residents do not seem to be bothered by this problem as they can deal with it by using energy consuming appliances. However, the continual increase in fossil fuels in the country could make the houses either very expensive or unusable in the future.

### 8.2.2 Water and Energy consumption.

Energy is crucial to control and improve housing microclimate (Mohd Ariffin, Behaz, & Denan, 2018).

Unfortunately, energy consumption is related to good quality of life at homes. Many technologies that bring ease to residents are high energy consuming particularly central heating and air conditioning which are now considered as a norm (Ortiz, Kurvers, & Bluysen, 2017).

The question about Water and energy consumption in this survey was supposed to compare the cost of water and energy consumed to households' income. The information about financial income is considered very private and then the response rate would be very low, even when asking for the cost paid of electricity, gas and water; 30% of the total number of respondents in the three collective estates for example did not answer the question. Consequently, the study was limited to compare the cost paid in winter to that paid in summer.

A) Electricity consumption.

Estates	No response	The cost of Electricity consumption (DZD)							
		Summer				Winter			
		1000 - 2000	2000-3000	3000-4000	Over 4000	1000-2000	2000-3000	3000-4000	Over 4000
<b>Mezghitane</b>	4	2	4	0	0	3	3	0	0
<b>400 houses</b>	1	3	2	1	3	6	3	0	0
<b>375 houses</b>	6	0	2	1	1	2	1	1	0
<b>Self-build</b>	0	1	0	1	8	1	1	4	4
<b>Souika</b>	0	0	6	0	2	0	3	0	2

B) Consumption of Gas.

Estates	No response	The cost of Gas (Winter/Summer)			
		Equal	Nearly Double	3 times	4 times
<b>Mezghitane</b>	10	0	0	0	0
<b>400 houses</b>	1	3	6	0	0
<b>375 houses</b>	6	0	3	1	1
<b>Self-build</b>	0	1	6	2	1
<b>Souika</b>	1	0	7	0	0

## C) Consumption of Water.

Estates	No response	The cost of Water (Winter/Summer)			
		Nearly Equal	Nearly Double	3 times	4 times
<b>Mezghitane</b>	7	3	0		
<b>400 houses</b>	1	4	5		
<b>375 houses</b>	6	4	2	1	1
<b>Self-build</b>	0	3	7		
<b>Souika</b>	1	7			

**Table 8.1: Comparison of Water and energy consumption between summer and winter: A) Electricity consumption, B) Gas consumption and C) Consumption of water.**

The results found in thermal comfort explain the energy consumption:

- The consumption of electricity in the 400 houses and 375 houses estate is approximately doubled in summer in comparison to winter as they all use air conditioners. However, the consumption of gas is much higher in winter than in summer as they all use heaters. In the Mezghitane estate, the cost of electricity is similar between summer and winter as the majority of them don't have air conditioners. The consumption of water in the 400 houses and 375 houses estate is much higher in summer in comparison to winter. But, in the case of Mezghitane estate the price is nearly the same in all seasons as they pay a lump sum.
- The cost of electricity in the majority of Self-build houses during summer is approximately two times in summer in comparison to winter as they all use air conditioners. However, the consumption of gas is much higher in winter than in summer as they all use heaters. Consequently; these results reflect the poor level of thermal design could make the houses either very expensive or unusable in the future. The consumption of water in summer is much higher than in winter.
- In half of the studied courtyard houses, the consumption of electricity is approximately double in summer in comparison to winter which can be explained by the use of air conditioners. However, the consumption of gas is much higher in winter than in summer as the majority of them are using gas-heaters. The consumption of water is approximately the same in both seasons.
- It has been shown from table 8.1 that residents of Self-build houses pay much more on electricity than the other types of houses. This is obviously related to the large area of houses which require more energy for the operation of the house.

### 8.2.3 Daylighting.

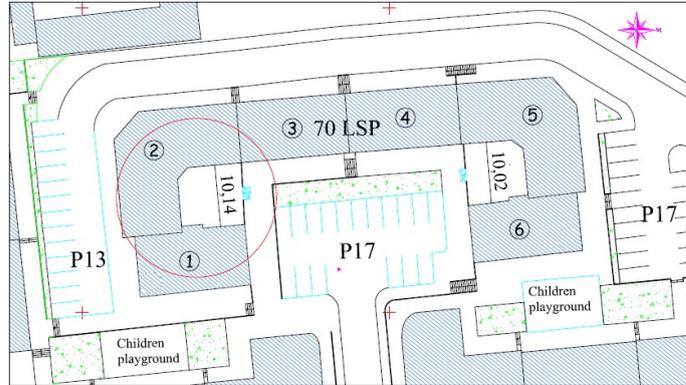
Daylighting is an important approach in modern architecture and housing design by which natural light can be infiltrated into the different internal spaces through building opening in order to replace or complement artificial lighting, this can help on reducing the energy consumption and enhancing visual comfort (Li & Lou, 2018).

#### a) Collective houses.

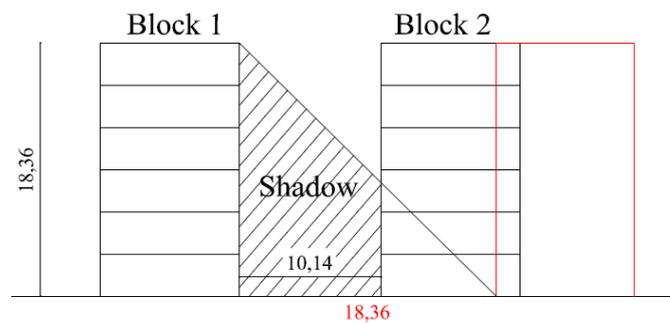
The vast majority of respondents consider daylighting as good or satisfactory as they have windows in all rooms.

The two respondents in Mezghitane estate that consider daylighting insufficient are living in Block 2. The distance between the Eastern facade of the block and block 1 is only 10 m when it is fixed by urban legislations (Law 90-29 of 1 st December 1990 related to planning and urbanism) to be at least equal to the high of block 1; in this case it should be 18.36 m. Consequently, the shadow of block 1 and Block 6 cover the eastern facades of blocks 2 and 5 successively.

A) Plan.



B) Section.



**Figure 8.5: Schematic explanation of the lack of daylighting in some apartments in Mezghitane estate: A) Plan and B) Section.**

**b) Self-build houses.**

The vast majority of respondents consider daylighting as good or satisfactory as they have windows in all rooms.

**c) Souika.**

More than half of the respondents consider daylighting as insufficient due to the fact that not all rooms are equipped with windows. In addition, the vast majority of the houses have the windows that open on the courtyard (Figure 8.6) and the natural light gradually diminishes from the top floor to the ground floor and the rest of the houses have just small windows (Figure 8.7).

A respondent said: "None of the rooms have windows; the daylight comes from courtyard and penetrates from the doors. We have to use electrical light in rooms even during summer days and this increase the cost of electricity".



**Figure 8.6: Windows opened on the courtyard.**



**Figure 8.7: Small exterior windows**

Controversially, in most of the case studied houses curtains have been used as a protection from sunshine (This is the easiest and cheaper method used as a protection) in both spring and summer times (Figure 8.8).



Figure 8.8: The use of curtains as a protection from sunshine.

### 8.2.3.1 Discussion.

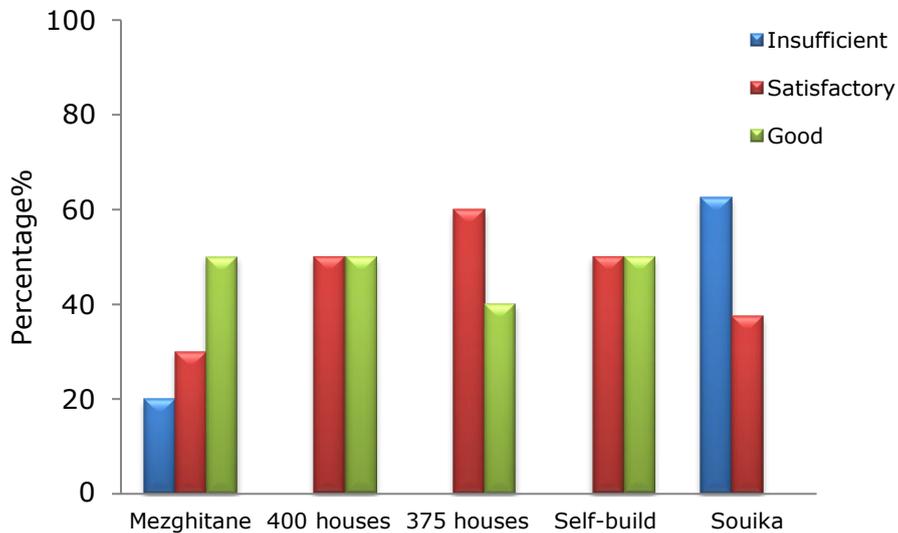


Figure 8.9: Residents' evaluation to daylighting in their houses.

Daylighting is considered sufficient in both collective and self-build houses as they have windows in all rooms. In courtyard houses, not all rooms are equipped with windows and the vast majority of the houses have the windows that open on the courtyard or have just small windows in the exterior facade. The reason for this design is caused by the need to provide privacy but this reduces daylighting and results in dark rooms. The modern life style and the integration of women with men to all fields of work has changed the traditional way of living and the measures of privacy that were needed in the past and this may indicate future changes too.

### 8.2.4 Acoustic comfort.

The first definition of acoustic comfort is “a concept that can be characterized by absence of unwanted sound and opportunities for acoustic activities without annoying other people” (Vardaxis, Bard, & Persson Waye, 2018). The evaluation of acoustic comfort is related to listeners’ perception and estimation of their overall sound environment (Chen & Kang, 2016) since people are the principle element in today’s planning and design method (Yang & Kang, 2005).

In this section, residents' evaluation to acoustic comfort is investigated and the different sources of noise are been identified.

#### a) Collective houses.

The noise and its sources differ between the three estates. In 400 houses estate, mainly all respondents (90%) suffer from noise and the main cause of it is traffic (80%). In the other two sites, just half of them suffer from noise. The main causes are traffic in the Mezghitane estate (50%), and noise from neighbours and construction work in 375 houses.

#### b) Self-build houses.

Half of respondents find the noise a big problem but its sources differ between the different studied houses. Also, half of them state that traffic is the main source of noise.

#### c) Souika.

The noise and its sources differ between different parts of Souika. Half of the respondents considered the noise as a big problem, while 37.5 % considered it a small issue and only 12.5% answered that it is not a problem for them.

The main source of noise is mainly neighbours talking especially in the houses which are occupied by multifamily groups that are strangers. Just 12.5% of residents complained about the noise and these are the inhabitants of houses located in the periphery of the quarter. Another 12.5% complained about the noise of children playing in courtyards. Some of respondents answered that the souks are another source of noise.

#### 8.2.4.1 Discussion.

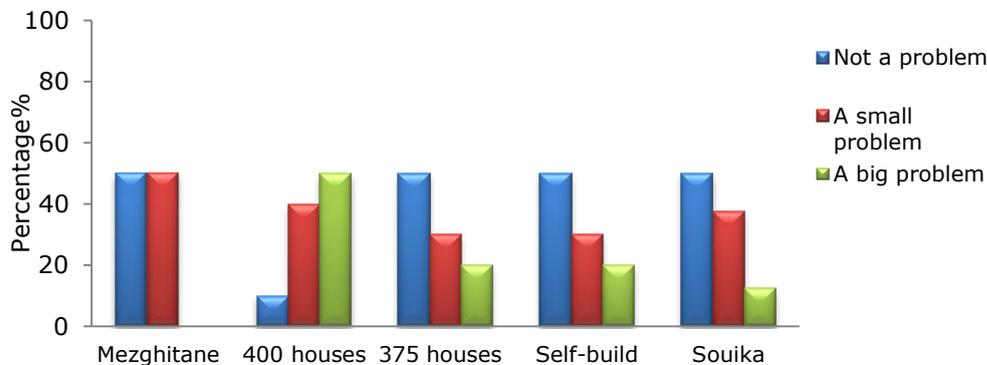


Figure 8.10 : Inhabitants' estimation to the noise.

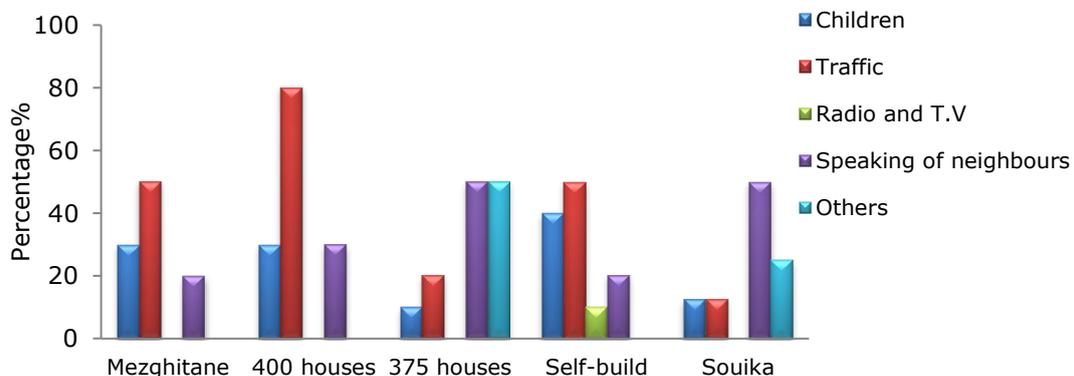


Figure 8.11: Different sources of noise.

The impacts of noise and its sources differ between the studied sites. The main causes are traffic particularly the houses built on important roads or the noise of neighbours; this can be corrected by the use of double glazed windows on facades that face important roads. Also, the use of isolation techniques on floors and separating walls is needed.

### 8.2.5 Air quality.

Indoor air quality has direct influence on human health. It is related to many factors such as the intensity of pollutants in the inside air, degree of humidity, occupancy rate, specific climatic conditions and ventilation.

In Europe, optimal air quality parameters are strictly regulated and mandatory for contemporary residential buildings (Nica, Hapurne, Dumitrascu, Bliuc, & Avram, 2018).

Residents' evaluation to ventilation, air pollution and humidity is reported in this section.

#### 8.2.5.1 Ventilation.

Natural ventilation supplies fresh outdoor air to buildings and evacuates indoor air; it can affect thermal comfort in the indoor environment with suitable indoor air quality. In fact, an insufficient ventilation rate is associated with a considerable number of health problems (Lai et al., 2018) (Zhao et al., 2018).

##### a) Collective houses.

The vast majority of respondents consider ventilation as good and satisfactory as they have windows in all rooms.

##### b) Self-build houses.

All respondents consider ventilation as good and satisfactory as they have windows in all rooms.

##### c) Souika.

Although not all houses have windows, half of the respondents consider that natural ventilation as satisfactory, 25% considered it good and the remaining 25% stated that it is insufficient. This can be explained by the fact that courtyards provide sufficient air to most of the case studied houses.

#### ➤ Discussion.

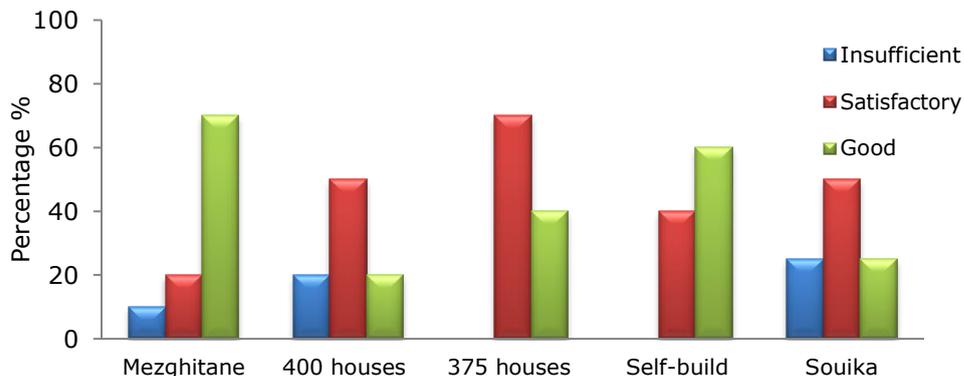


Figure 8.12 : Inhabitants' estimation of ventilation in their houses.

Ventilation is considered good in all studied houses due to the windows in collective and self-build houses and the courtyard in courtyard houses. It is always important to have natural ventilation in the house from windows or even from a courtyard or a patio.

#### 8.2.5.2 Air pollution.

##### a) Collective houses.

70% of respondents in Mezghitane estate suffer from air pollution and consider it as a problem; some of this pollution is caused by dust from construction sites for car parks and green areas which have not been completed (Figure 8.13).



**Figure 8.13: non-arranged car parks in Mezghitane estate.**

In the remaining two sites just 40% of respondents find air pollution a problem due to traffic in the 400 houses estate and caused by other smells in the 375 houses estates, particularly the fumes coming from the tannery.

A respondent in 375 houses estate: " Sometimes we suffer from the odours emanating from chemicals and leathers of the tannery which is about 1000 m".

**b) Self-build.**

Just 30% of respondents are suffering from air pollution and they consider it as a big problem; this pollution is caused by dust, and the residues of tannery for the houses closed to it.

**c) Souika.**

More than half the respondents (62.5%) considered that air pollution is not a problem. The remaining considered it as a problem when the wind is high; they stated that the main causes are dust resulting from the destruction of neighbouring houses (Figure 8.14) and the rehabilitation of others (Figure 8.15). Also, smells of food (for instance pizza and grilled meat) sold on the streets are another source of air pollution in some roads in the quarter.

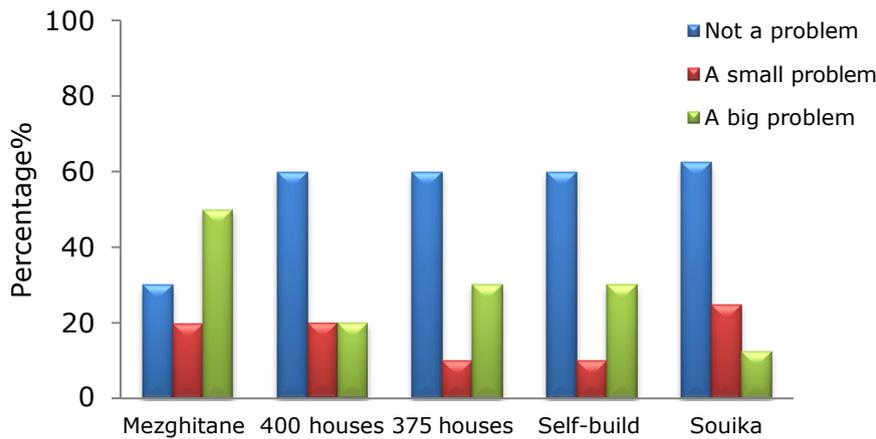


**Figure 8.14: Destroyed houses.**



**Figure 8.15: Rehabilitation of some houses in Souika.**

**8.2.5.3 Discussion.**



**Figure 8.16: Inhabitants' estimation to air pollution.**

Residents of collective houses are suffering from air pollution; however the main causes are not permanent; such as the dust from construction sites near the estate and uncompleted car parks and green areas. These causes will disappear when the onsite work and the arrangement of car parks and green areas have been completed. Consequently, local authorities should ensure the timely delivery of houses for occupation after the completion of all buildings and arrangement works in the estates. It is true that this is already set in law by the Algerian government; however, it is not always followed because of the exceeding of the completion time limits of projects built by both private and public developers.

In addition, some residents of collective apartments and self-build houses are suffering from fumes and residues of the local tannery. Local authorities should act to resolve this problem and control the fumes and residues of different factories in the city due to their negative effects on human health and comfort.

The main causes of air pollution in courtyard houses are not permanent as they are dust resulting from the demolition of neighbouring houses and the rehabilitation of others.

The other causes are resulted from commercial activities in the ground floor of houses such as the smell of food (for instance pizza and grilled meat) sold on the streets.

**8.2.5.4 Humidity.**

**a) Collective houses.**

Taken together, the majority of inhabitants in the three estates consider humidity as low or not a problem.

However Table 6.8 shows that half of respondents in Mezghitane estate find that humidity is high - this is assumed due to the location of the estate which is close to the sea.

**b) Self-build houses.**

The majority of inhabitants consider the rate of humidity as low or not a problem.

**c) Souika.**

Most of the inhabitants (62.5%) consider humidity as high (Table 8.3) and this is mainly due to the lack of windows.

**8.2.5.5 Discussion.**

Estates	Not a problem	Low	High
Mezghitane	40%	10%	50%
400 houses	40%	30%	30%
375 houses	30%	40%	30%
Self-build	30%	40%	30%
Courtyard houses	25%	12.5%	62.5%

**Table 8.2: Inhabitants' estimation of humidity.**

The level of humidity is considered to be low in collective apartments and self-build houses. But in courtyard houses it is considered to be high which is mainly due to the lack of windows and associated ventilation.

### 8.2.6 Privacy.

#### a) Collective houses.

The majority of respondents in the three estates find their houses overlooked (Table 6.9). A respondent in 400 houses estate stated: "The houses are overlooked and the lack of privacy is caused by the commercial activities and doctors' offices in the ground floors of buildings which allow a daily movement of strangers in the blocks".

When the inhabitants were asked if their visitors can go straight to a separate reception room without passing through other private rooms, the majority of respondents said yes. Also, the majority of them preferred to have such organisation. Only 30% of respondents in each site are not comfortable when they have a guest in the house.

#### b) Self-build.

Most of respondents find their houses overlooked. Just 20% of the residents find the house too cut off but they stated that the house is overlooked in the facades looking to the garden.

Also, all respondents stated that their visitors can go straight to a separate reception room without passing through private rooms; and the majority of them prefer to have such organisation. Only 30% of the respondents are not comfortable when they have a guest in the house.

#### c) Souika.

All respondents find their houses too cut off.

When the inhabitants were asked if their visitors can go straight to a separate reception room without passing through other private rooms, the majority of respondents said no.

Also, the majority of them preferred to have such organisation, the remaining 37.5% don't have any preferences. The vast majority of respondents (87.5%) stated that they are not comfortable when they have a guest in the house.

#### 8.2.6.1 Discussion.

Estates	Overlooked	Too cut off
Mezghitane	60%	40%
400 houses	80%	20%
375 houses	70%	30%
Self-build	80%	20%
Courtyard houses	0	100%

Table 8.3: Inhabitants' estimation to the privacy of their dwellings.

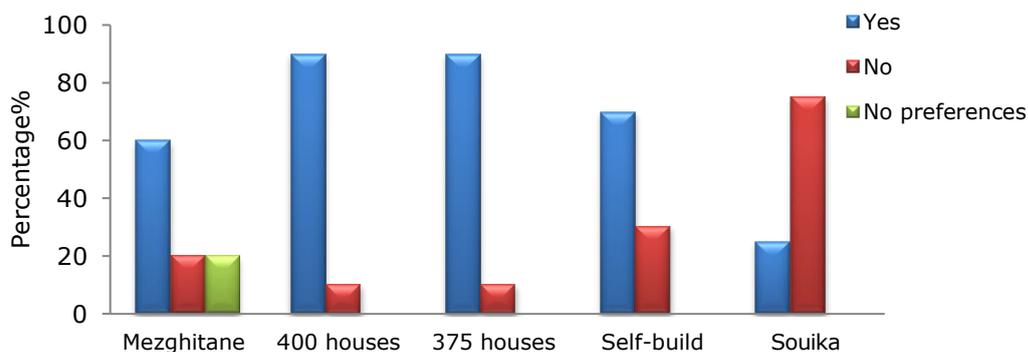


Figure 8.17: Inhabitants' estimation to the privacy of the living rooms.

The vast majority of collective and self-build houses are overlooked. However, the spatial organisation of interior spaces affords a good level of privacy that satisfies most of the inhabitants even when they have a guest in the house.

Conversely, while all courtyard houses are too cut off, the vast majority of residents are not comfortable when they receive a guest as the guests have to pass through private rooms in order to go to reception room. This is mainly the result of overcrowding and the occupation by non-relatives; consequently, this has impacted adversely on one of the main characteristics of the traditional courtyard house.

### **8.3 Occupant's reaction to design.**

#### **8.3.1 Housings' occupation.**

##### **a) Collective houses.**

In the Mezghitane estate as the project is new, most of the interviewees started living in their houses a few months before the survey.

Approximately, half of respondents in the 400 houses estate and the 375 houses estate have changed their houses: they enclosed balconies and loggias in order to gain more space for the kitchens and the living rooms. Also, some finishing works has been done in the three estates due to the very bad original finishing work done by the state.

In the Mezghitane estate, just 30% of respondents have changed in their houses and that was normally finishing work in the kitchen, toilet and bathroom. However, all respondents desire to change in their houses in more significant ways but are prevented from doing so because the Agency (Project owner) does not permit it as the compliance certificate of the project is not delivered yet. Such changes especially which involve external facades, will often mean that the municipality will not issue the certificate which will cause financial problems to the agency, and the inhabitants will not have their act of property.

In the two social estates, 70% of respondents desire to change their houses due to the small area of it.

In the 375 houses estate, half of respondents desire to change their houses in order to change the exterior environment.

##### **b) Self-build houses.**

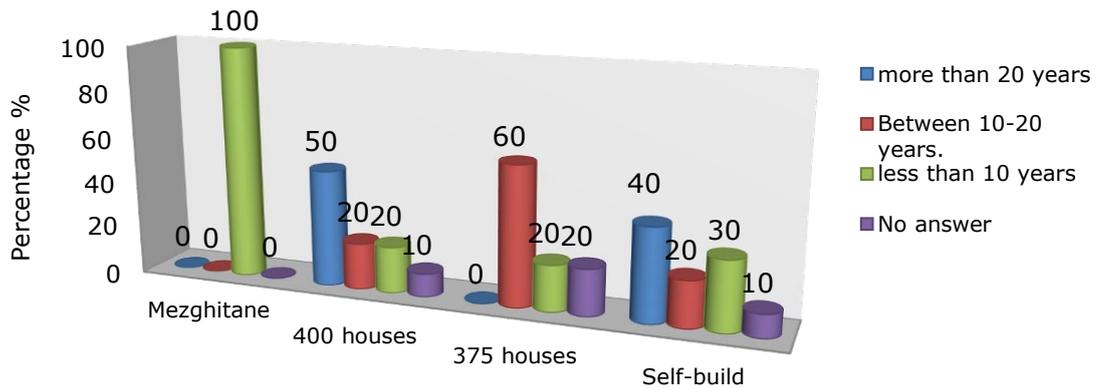
When residents were asked about the number of years that they lived in their houses: The majority of sixty percent have lived in their dwellings for less than 20 years. The remaining forty percent have lived for more than 20 years.

- A negligible number of 20% of respondents in the case studied houses have changed in their houses.
- A small number of (20%) of the interviewees desire to do some modifications in their houses in order to gain more comfort. Also, just a small number want to change the house and this is often due to the location of the house. However, all respondents are overall satisfied with their houses.
- When they were asked in which type of houses they prefer to live if they had the choice, the majority of respondents prefer an individual villa with a garden.
- All the respondents want to participate in the design of their houses.
- In the three estates residents suggest building cities with less densities, green areas and children playgrounds.

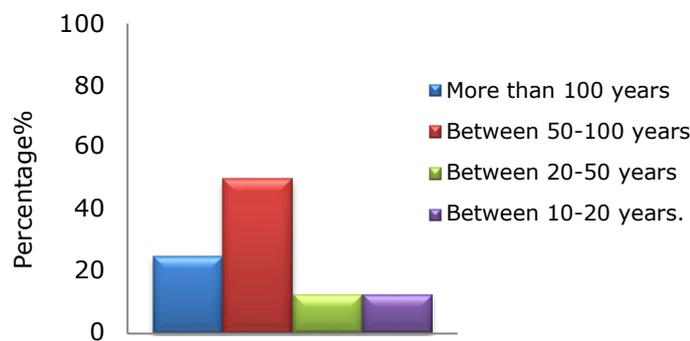
##### **c) Souika.**

Half of residents started living in Souika with their families before the Algerian revolution (1954). Some families (25%) had ancestors living there even before the start of French occupation of the country (1830). 12.5% stated that their families had lived between 20-50 years and the remaining 12.5% had lived between 10-20 years and they are not the owners of the houses they are just renting from private.

### 8.3.1.1 Discussion.



**Figure 8.18: Housing occupation.**



**Figure 8.19: Housing occupation in Souika.**

Length of residence was found to be slightly related to the inhabitants' satisfaction of their houses. The most dissatisfied respondents were from Mezghitane estate where all new properties were in use and they had the shortest tenure longevity in comparison with the residents' in the other sites. The longest the residents stayed in their houses the more related and more satisfied they tended to become.

### 8.3.2 Modifications in houses.

#### a) Collective houses.

Approximately, half of respondents in the 400 houses estate and the 375 houses estate have changed their houses: they enclosed balconies and loggias in order to gain more space for the kitchens and the living rooms. Also, some finishing works has been done in the three estates due to the very bad original finishing work done by the state.

In the Mezghitane estate, just 30% of respondents have changed in their houses and that was normally finishing work in the kitchen, toilet and bathroom. However, all respondents desire to change in their houses in more significant ways but are prevented from doing so because the Agency (Project owner) does not permit it as the compliance certificate of the project is not delivered yet. Such changes especially which involve external facades, will often mean that the municipality will not issue the certificate which will cause financial problems to the agency, and the inhabitants will not have their act of property.

In the two social estates, 70% of respondents desire to change their houses due to the small area of it.

In the 375 houses estate, half of respondents desire to change their houses in order to change the exterior environment.

#### b) Self-build houses.

A negligible number of 20% of respondents in the case studied houses have changed in their houses.

A small number of (20%) of the interviewees desire to do some modifications in their houses in order to gain more comfort.

**c) Souika.**

Half of respondents have changed in their houses when 50% of them were forced for rehabilitation by public services. The remaining have demolished some parts of the houses in order to gain more space or built a toilet in some cases.

However, currently just 25% of respondents desire to change in their houses. These are the inhabitants of rehabilitated houses and they wish if their houses could return to the original design.

Another 25% answered that they cannot modify their houses because they are renting from private landlords, otherwise they would modify in order to gain more space and build a private toilet and bathroom.

**8.3.3 Housing satisfaction.**

**a) Collective houses.**

In 375 housing estate residents are more satisfied by their houses in comparison to the other estates.

The causes of dissatisfaction differ between the three estates. In the 400 housing estate, half of respondents are dissatisfied because of the area of the house. In Mezghitane estate, 40% are dissatisfied due to the location of the estate.

**b) Self-build houses.**

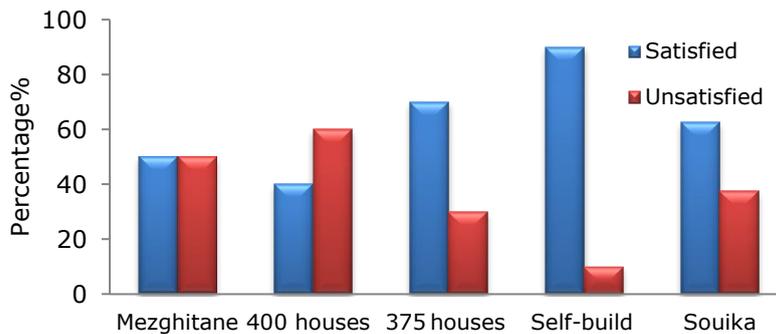
Just a small number want to change the house and this is often due to the location of the house. However, all respondents are overall satisfied with their houses.

**c) Souika.**

Just 37.5% of respondents are not satisfied by their houses and desire to move due to overcrowding and the occupation of multi-family households which are not relatives in some cases; another issue is social problems for some of them caused by daily contact with other households. The remaining 62.5% are satisfied by their dwellings because it is a family heritage for some of them which can be considered as an emotional reaction, and for its location in city centre for others.

A male respondent said: " We cannot change the house; it is the house of our ancestors".

**8.3.3.1 Discussion.**



**Figure 8.20: Housing satisfaction.**

The causes of dissatisfaction	Estates				
	Mezghitane	400 houses	375 houses	Self-build	Souika
Location.....	40%	40%	10%	10%	0
Arrangement of space...	20%	20%	10%	0	12.5%
Type of neighbours.....	0	0	10%	0	25%
Aspect (external).....	20%	10%	10%	0	0
Area of house.....	30%	50%	10%	0	25%
High energy costs.....	0	0	10%	0	0
Lack of comfort.....	30%	30%	0	0	12.5%

**Table 8.4: The causes of inhabitants' dissatisfaction to their houses.**

In order to evaluate residents' satisfaction with their dwellings, respondents in the three selected types of housing were asked if they are satisfied with their houses and the cause of dissatisfaction if they are not satisfied.

In collective houses the results showed that residents of promotional (luxurious) houses are more satisfied by their flats and they only want to change their dwellings in order to change the exterior environment; however more than half respondents already have changed in their houses such as closing balconies or loggias in order to gain more space and some finishing works. The residents of the other estates claimed impacts from the size of their houses in social houses and the location of the estates for Mezghitane estate. A significant number of respondents have changed or want to change in their flats in order to gain more space or to ameliorate the impacts of finishing works.

All residents of self-build houses are satisfied of their houses and just a small proportion of them has changed or wants to change in their dwellings; this is because the houses were built according to their choices and preferences. Also, residents were integrated in both design and construction processes.

Also, the majority of residents in traditional courtyard houses are satisfied by their houses and they are attached to their dwellings as it is a family heritage, also due to its location in the city centre. The remaining wants to change their houses due to the small area of it and family problems for some of them caused by daily contact with other households.

### **8.3.4 Housing preferences.**

When asked about their housing preferences, residents of collective apartments and even those of self-build houses answered that they prefer to live in an individual villa with a garden. While residents of courtyard houses prefer to live in a courtyard house but without sharing the house with strangers. Also, all respondents want to participate in the design of their houses.

All residents suggest that it will be better to build cities with a small number of houses, bigger apartments with green areas and children playgrounds.

In addition some residents suggested building bigger houses and providing more security for the new estates. Moreover, they proposed that affordable transport and the necessary infrastructures should have been included. Furthermore, they thought that finishing work such as painting, wall and floor tiles should be left to the residents.

## **8.4 Results.**

The study of the different types of houses: Collective houses, self-build houses and traditional courtyard houses have been carried out through the analysis of the quantitative data resulted from the survey questionnaires conducted in sites adding to direct observation and the informal discussions with different households. The main results of the comparison study are presented below:

Residents of traditional courtyard houses are satisfied by this type of dwellings and attached to the traditional lifestyle as they are used to it. However, this kind of houses doesn't reflect the level of comfort that was available in the past. This is mainly due to the present state of houses; degradation, overcrowding and the occupation of non-relatives multifamily in the same house. Consequently, this type of houses cannot be used as a reference to new housing projects since the reaction of residents against their houses seems to be an emotional reaction that cannot be found in residents of other types of housings. Also, the modern occupant expectations have changed through the education of women and their integration in the society and in different fields of work. This has changed the relationship of women and men which consequently impacts on people's lifestyle and creates new social needs. However, there are other important characteristics that can be considered and learnt from the design of courtyard houses as was reviewed in chapter 4: including the use of local materials and the passive design techniques.

The key criterion that residents are concerned with is spatial comfort. People in self-build houses and the promotional collective estate are more satisfied in terms of space than the others; however, people in some cases still want extra rooms to get more space and more comfort.

Residents are not concerned by thermal comfort as they can deal with cold and heat using energy consuming space conditioning appliances. However, the continual increase in fossil fuels in the country could make the houses either very expensive or unusable in the future.

The exterior environment and the existence of different amenities and services needed in daily life have affected the satisfaction of residents. It is true that new agglomerations are planned within all necessary public amenities and facilities. However, the way those houses are delivered before providing the minimum of needed services even public transport (the example of Mezghitane estate) resulted in some difficulties and create an uncomfortable living environment for residents.

Although, people are satisfied by their apartments in the example of the promotional estate and self-build houses, inhabitants would prefer to have an individual villa with a courtyard or a garden. This cannot be achieved because of the problem of availability of land. This dilemma faces the city of Jijel and the other cities of the North of the country which affects the satisfactory realisation of residential projects (both promotional and social). In fact, the government aims to build projects of even higher densities (increasing the height and the number of stories rather than building larger plots). These steps have been considered as necessary in order to face up to the housing crisis. Indeed, it is not always possible to satisfy all people's needs and desires. However, it is necessary to find a method to integrate people's preferences in the process of design.

### **8.5 Conclusion.**

This chapter presented the environmental design issues and residents reactions in the different types of the studied houses. It investigated the residents' evaluation to thermal comfort, daylighting, water and energy consumption, acoustic comfort, air quality and privacy.

This chapter has also investigated the inhabitant needs and expectations in terms of design. Then, the residents' preferences have been assessed in order to be taken into account in the design of future housing projects.

This chapter has presented a comparison of the results collected from the surveys questionnaire from previous chapters 6, 7 and this chapter 8 with the inhabitants of different types of houses. This comparison has clearly showed that traditional courtyard houses cannot be considered as an example of sustainable housing due to the degradation of houses caused by the age and lack of maintenance. Also, overcrowding and the occupation of non-relatives in some houses have caused a lack of comfort and privacy. The comparison has also showed that people are more concerned by spatial comfort with total neglect to thermal comfort as they can afford it using energy consuming appliances.

## **Chapter 9: Conclusions and Recommendations.**

### **9.1 Introduction.**

This chapter concludes the present thesis and discusses the major findings. It presents a review of information and summarises the extent to which this research has achieved its objectives. It presents some suggestions and recommendations to help stakeholders and designers in developing strategies to create new sustainable cities that can achieve both residents' satisfaction and reduce negative impact on the environment. The chapter is concluded by a brief overview of the limitations of the research and its contribution to knowledge; the final section suggests areas for future research to enable the development of sustainable housing.

### **9.2 Review of information.**

Investigating the main issues of housing sector and sustainability development in Algeria revealed many facts that can be summarised as follows:

- Since its independence in 1962, Algeria has been facing an ongoing serious housing crisis and many problems are found in the housing sector; the most important issue is the serious imbalance between housing demand and its availability. In fact, the housing policies adopted in the country have clearly failed to cope with the problem.
- Sustainable development and the awareness of energy efficiency is a new tendency not yet fully developed, but it is growing increasingly important as a result of setting a legal framework for the implementation and the use of renewable energies.
- Algerian professionals are not as aware as they should be of the subject of sustainability and the majority of those involved blame the government for this.
- Vernacular houses in Algeria were built over history according to environmental factors and each type fulfilled social needs and society values and traditions. It is crucial to study and learn from traditional cities and use the information to help promote sustainable development in order to suit contemporary needs. However, modern occupant expectations have changed through the education of women and their integration in the society and in different fields of employment.
- Creating sustainable cities is obviously important for the present and future world. Whilst there are some obvious deficiencies and a lack of knowledge about some aspects of sustainability, they are good initiatives linked to sustainable communities that can help deal with the world's present and future energy demand and tackle climate change.

### **9.3 Achievement of objectives.**

The results of this research are expected to be of great benefit for housing design as they present both positive and negative features of traditional and contemporary housing in addition to the needs of the residents' and their expectations in terms of design. Moreover, these results provide a set of guidelines that help stakeholders and designers in developing future sustainable housing settlements. The achievement of the objectives of this research can be summarised as follows:

**Objective one:** Explore and understand urban sustainability and the issues surrounding it by examining sustainability criteria. This aspect had been studied in order to highlight the need of achieving sustainability in housing and urban areas. This had been developed through the study of the impacts of urban systems on sustainability with reference to Algeria. This objective has been described in chapter 2.

**Objective two:** Investigate the current situation of housing sector in Algeria. This has been presented in chapter 3 of this thesis with sufficient detail in order to clarify the need for research the housing situation and housing policy in the country. It has been shown that the country is facing a severe housing crisis in both quantitative and qualitative levels and the housing policy adopted by the Algerian government fails to tackle this dilemma.

**Objective three:** Investigate sustainable development through legislation in Algeria. This has been achieved in chapter 5 through the presentation and analysis of a number of laws and regulations related to sustainability in the built environment. It was concluded that the Algerian government seems aware of the risks that threaten the environment through its participation in the world commissions and through the set of a legal framework. In fact neither the government nor the citizens are willing to take responsibility to reduce the risks that face present and future generations.

**Objective four:** This aimed to assess the building professionals' awareness in terms of sustainability through a questionnaire survey with professionals and stakeholders. This has been achieved through the conduction of a survey questionnaire with a considerable number of professionals and stakeholders that have a direct impact on the built environment in Algeria. The survey showed that Algerian professionals are not as aware as they should be of the subject of sustainability and the majority blame the government for this. This has also been studied in chapter 5.

**Objectives five, six and seven:** These concerned analyses and comparisons of traditional and contemporary housing in terms of exterior environment, comfort and resident satisfaction. This was done in order to identify the main features of new and traditional settlements in Algeria and to examine occupants' expectations in terms of design. These objectives have been achieved through direct observation, survey questionnaires and interviews with potential users of different types of housing, both traditional and contemporary. These objectives have been studied in chapters 6, 7 and 8.

**Objective eight:** Provide stakeholders, designers and residents with suggestions and recommendations to aid planners in developing strategies to create new sustainable cities that can achieve both residents' satisfaction and reduce negative impact on the environment. This objective has been achieved in chapter 9.

#### **9.4 Major findings.**

One of the important findings of this research is that the Algerian professionals are not as aware as they should be of the subject of sustainability and the majority blame the government for this. To tackle the issue, this research recommends introducing the continuing professional development (CPD) in the workplace. This strategy will ensure that professionals are kept up to date with progresses and developments in their field. This will hopefully increase awareness of the importance of sustainability amongst professionals and the author believes that this is a necessary step towards achieving sustainable design and development.

One important hypothesis in this research is that traditional settlements are more suitable for the local population than modern residential group schemes. However, the author in this thesis shows that the present state of courtyard houses in Constantine do not reflect the level of comfort that was found in the past. This is the result of degradation, overcrowding and the over-occupation of houses by non-relatives in multi-family accommodation. On the other hand, residents of courtyard houses of Constantine are generally satisfied and attached to their houses. This can be considered as not more than an emotional reaction that cannot be found in residents of other types of housings. Consequently, traditional houses should be used as a reference point to guide development of new housing projects.

One of the major findings of this research is that the quality of the exterior environment and the existence of different amenities and infrastructures needed in daily life have a great impact on residents' satisfaction. It is true that new agglomerations are planned including

all necessary public amenities and facilities. However, most if not all of these houses are often delivered prior to the provision the minimum of necessary services such as public transport has resulted to some difficulties and created an uncomfortable living environment for residents.

Spatial comfort is the prime criterion that concerns the inhabitants. Even when residents are satisfied with their houses in terms of space (floor area) they prefer to have extra rooms in order to gain more space and more comfort. On the other hand, climatic design principles are totally neglected in both private and governmental houses where residents are not concerned about thermal comfort as they feel they can deal with it using energy consuming appliances. However, the continual increase in fossil fuel use and energy costs in the country could make the houses either very expensive or unusable in the future. In addition, the other criteria of comfort are not considered in the design; such as location and security. Even in the promotional estate where the prices of houses are much higher and cannot be compared to the other estates, the state or urban services do not include any consideration to the choice, location, and orientation of the site.

Although, people are satisfied with their apartments in the example of the promotional estate and self-build houses, inhabitants would prefer to have a modern individual villa with a courtyard or a garden. Most residents suggest that it would be better to build cities with a small number of houses, bigger apartments with green areas, and to include building of children's playgrounds in future housing settlements. This cannot be achieved because of the problem of availability of land. This dilemma faces the city of Jijel and the other cities of the North of the country which therefore affects the satisfactory realisation of residential projects (both promotional and social). In fact, the government aims to build projects of even higher densities (increasing the height and the number of storeys rather than building larger plots). These steps have been considered as necessary in order to face up to the housing crisis. In fact, the government should promote the southern part of the country when the land is available and population density is very low in order to encourage the population of the North to settle there. Also, it is not always possible to satisfy all people's needs and desires. However, it is necessary to find a method to first combat the houses crisis in the country and to integrate people's preferences in the process of design.

### **9.5 Suggestions for future housing design in Algeria.**

The results have been collected from the questionnaire surveys conducted in previous chapters 6, 7 & 8 in addition to the research conducted in chapters 2, 3, 4 & 5. These have been used to present a detailed analysis of the housing situation in Algeria as well as the expertise of the author as a practitioner architect in housing department; all these factors have allowed the formulation of a number of suggestions for stakeholders and planners to aid in developing strategies to create new sustainable cities that can achieve both residents' satisfaction and reduce negative impact on the environment. These can be summarised under the following headings:

- **Regulations and assessments.**

1. Passive design techniques should be applied by law and the government should be strict in the application of its regulations; it can be applied as a condition for getting the permit of construction in order to encourage energy savings in housing projects and then to lower the operational cost of houses. In this context, it is necessary to provide training for architects, planners and designers and afford suitable continuing professional development (CPD) in the workplace. Also, the use of renewable energy sources should be integrated and encouraged which will reduce the consumption of non-renewable sources of energy (Chapter 5).
2. Integration of the new technologies and techniques in all fields of work should be required in order to speed the administrative procedures in all stages of projects:

Choice of land plot, design, and construction in order to deliver the houses in their deadlines (Chapter 3).

- **Increasing awareness and enforcement.**

There is an urgent need to raise awareness and encourage sustainable behaviours in residents such as recycling, and the preservation of public areas such as the existing green areas and children playgrounds. The government should prohibit and strictly penalise any act of vandalism or destruction of public areas (Chapter 6).

- **Promoting and improving exterior public areas.**

1. There is a need to provide external environment by public areas such as green spaces, secure children playgrounds (endowed with safe enclosure) and squares (Chapter 6).
2. Provide new residential areas with a minimum of amenities and facilities prior the delivery of new houses (Chapter 6).
3. There should be an assessment of the needs and expectations of future residents in order to be integrated in the design process. The needs can be evaluated through the conduction of surveys and direct interviews with future residents. It is true that direct interviews with a large number of residents will be difficult to conduct and will take much time; however selected samples and representatives can be used to get a good understanding (Chapter 8).

- **Improving internal spaces in the houses.**

**In the design process.**

1. There should be serious attempts to increase the number of rooms in public housing schemes without increasing the price. This can be achieved through the research of the best solutions to obtain the design that permit to increase the number of rooms in the same living area fixed by the government to a three-room apartment (living+ 2 bedrooms). The flats that have a living room + 2 bedrooms do not permit the male/female segregation which affects spatial comfort (Chapter 7).
2. Increase the size of bedroom if possible, it is suggested in this study that a bedroom of 12-14 m<sup>2</sup> is considered to have the right size (Chapter 7).
3. Increase the size of the kitchen, it is suggested in this study that a kitchen of 12 m<sup>2</sup> could satisfy the needs of households (Chapter 7).
4. A covered loggia or a balcony is necessary to be used as a storage place and for drying clothes. The area of such spaces should not be taken from the total living area but it should be designed to cover the exterior sidewalk (Chapter 7).

**In the construction process.**

Integrate future residents in the choice of their finishing works: the choice of walls and floors tiles, types and colour of paintings. This may be difficult to achieve, however it can be improved by regulation; either by leaving the finishing works of interior spaces to residents to be done in a predetermined period of time. Or this can be also done by giving the option to residents to choose between a range of colours and types of materials; this could also be done by internet (websites for developers) in a predetermined period of time (Chapter 8).

## **9.6 Limitations.**

Despite the wide range of issues investigated and raised in this research, some limitations were identified. These limitations included:

The first limitation is that this research focus on residential buildings in Algeria and the results cannot be applicable to other types of buildings such as: office buildings, industrial buildings and hotels.

The second limitation is that the courtyard houses are not the only type of traditional houses in Algeria; the results of courtyards cannot be directly applicable to other traditional dwellings in Algeria. This is due to the limitations in time and resources available to carry out the study of other types in different cities. However, this help to the identification of a number of areas where future research is needed.

The third limitation is that the information in the old city of Constantine was gathered through structured face to face interviews carried out by the researcher herself which was considered the easiest way to collect data and guarantee to have the responses due to the difficulty to find the houses in the medina (The vast majority of houses are not numbered or named). This has reduced the sample size, and took much more time for collecting the data needed.

The fourth limitation is that all the studied estate and houses are located within the North-East part of the country; the city of Jijel for contemporary houses and Constantine for traditional houses. This means that the findings of the present research might not be applicable to other parts of the country where the climate and the characteristics of households are different and which can affect the needs and expectations of the residents.

The fifth limitation is the inability to present all the plans of different studied houses (Self-build and courtyard houses) due to the lack of drawings.

The sixth limitation is the lack of detailed information about the building construction materials, energy consumption and water usage. This information is crucial in assessing the sustainability of houses.

The last limitation is that the research focused in the north part of the country which is witnessing a severe housing crisis since the independence of Algeria in 1962. These results cannot be relevant to the south part of the country where land is available and the population density is very low.

### **9.7 Research novelty, uniqueness, and contribution to knowledge.**

As research on sustainability in Algeria is still in its infancy, this research is unique and its contribution to knowledge is achieved on different levels:

- Issues discussed (sustainability, sustainability legislations and housing in Algeria).
- The research methodology adopted (comparing three different types of houses in Algeria)
- The value of the chosen studied area: as the research has primarily focused on Jijel, a developing Mediterranean city located in the north east of Algeria. Despite its rich natural setting, its moderate climate and its tourism potential, the city suffers from lack of sustainability and there were no previous research projects that studied housing sustainability.

After the study of a considerable number of PhD theses reviewed in chapter 2, the author here has concluded that many researchers have studied traditional architecture in North Africa and the Middle East region with particular emphasis on cities in hot climate and the desert. Yet there are no studies that investigated the feasibility of combining the sustainability potential of traditional houses and modern housing in designing new contemporary houses in Algeria. Therefore, this research project has investigated the different aspects and features of traditional and contemporary housing and urban planning in Algeria that are suitable for the planning of new sustainable settlements. In this context, the research has developed some suggestions for the design of sustainable housing

arranged under four headings: the setting of regulations and assessment; increasing awareness of key issues and enforcement; the promotion of design for exterior public areas; and the improvement of good design and construction processes for internal spaces in the house.

### **9.8 Recommendations for future research.**

Further research that can be conducted to complete and enhance the outcome of the present research:

- This research has focused on investigating the housing stock in the city of Jijel in the North east of Algeria; further research can examine housings in other regions of the country with different climate characteristics.
- This research has focused on sustainability of residential buildings in Algeria; further research can investigate other types of buildings such as: commercial, educational, health, industrial, hotels and offices.
- This research has focused on assessing residents' needs in Algeria; further research can focus on the views of stakeholders and designers.
- This research has focused on sustainability issues in design and occupation process; further research are recommended to study the rehabilitation process especially for traditional housing in order to preserve the architectural features that suit the occupants.

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**University of Huddersfield  
School of Art, Design and Architecture**

**Participant Information Sheet 1**

**Research Project Title: Sustainable Housing Design and Development in relation to the city of Jijel, Algeria.**

You are being invited to take part in a research project. Before you decide, it is important for you to understand why this research is being done and what it will involve. Please take time to read the following information and discuss it with others if you wish. Ask if there is anything that is not clear or if you would like more information. May I take this opportunity to thank you for taking time to read this.

**What is the purpose of the project?**

Dear/ Resident,

My name is Mia Mehibel. I am a postgraduate student at the University of Huddersfield in England. I am conducting a research project on the study of sustainable housing design and development in relation to the city of Jijel, Algeria. In this part of the research I am carrying out the following survey questionnaire that will allow me to compare between traditional and contemporary housing in Algeria. This will be achieved by evaluating people satisfaction and their expectations and preferences, regarding existing houses, both traditional and contemporary.

It would be greatly appreciated if you could answer the questions. This should take no more than **15 minutes** of your time.

The results of this study will hopefully help the planners and designers to improve the design of future housing to offer better satisfaction to the residents. Your answers will remain strictly confidential and anonymised before the data is presented in any work, in compliance with the Data Protection Act and ethical research guidelines and principles. The results of this research will be written up in **my Phd thesis**. If you would like a copy please contact the researcher.

**Do I have to take part?**

Participation on this study is entirely voluntary, so please do not feel obliged to take part. Refusal will involve no penalty whatsoever and you may withdraw from the study at any stage without giving an explanation to the researcher.

**Are there any disadvantages to taking part?**

There should be no foreseeable disadvantages to your participation. If you are unhappy or have further questions at any stage in the process, please address your concerns initially to the researcher if this is appropriate.

**Name & Contact Details of Researcher: Mia Mehibel.**

**Address: Lycee terkhouche Ahmed Jijel, Algeria.**

**E-mail: [mia-architecte@hotmail.fr](mailto:mia-architecte@hotmail.fr).**

**Appendix 1: Questionnaire Survey for Professional Actors.**

**Part one: Information about the professional.**

1. Gender of the person whose answering :

Male                       Female

2. Age:

20-29     30-39     40-49     Over 50.

3. Current occupation:.....

**Part two: Information about building sector.**

1. Do you have an idea of the objectives of sustainable development?.

Yes     No

- If yes, what phrases or types of design do you think of in sustainable development?.

Green energy     Efficient     Climate sensitive

2. How have you heard of the concept of sustainable development?.

In university     Work     Media

Other:.....

3. What do you think of the building sector and urban design in Algeria during the last 50 years (after the independence)?

Rich     Satisfactory     Poor.

- Please, give reasons for your answer:

.....  
.....  
.....  
.....  
.....

4. In your opinion, which of these types of houses is more sustainable than the other?

Modern houses                       traditional houses

Please, give reasons for your answer:

.....  
.....

➤ Between these two types of architecture (modern and traditional) in Algeria;  
which one meets the needs of local population in terms of:

a. Comfort.

➤ Daylighting.

Modern houses                       traditional houses

➤ Noise.

Modern houses                       traditional houses

➤ ventilation.

Modern houses                       traditional houses

➤ Space.

Modern houses                       traditional houses

b. Price

➤ Building costs.

Modern houses                       traditional houses

➤ energy consumption.

Modern houses                       traditional houses

➤ Reparation costs

Modern houses                       traditional houses

5. Do you think that the current planning regulations can be applied to aspects  
traditional architecture?

Yes       No

6. Do you think that the Algerian Government is making efforts to aware public and professionals to the topic of sustainability?

Yes     No

-How?

.....  
.....

7. What are the factors that you take into account in the design of new housing projects?

a) Individual houses (financed by individuals).

Socio-cultural factors     Climate and environmental factors

Economic factors     Client preferences

Others: .....

b) Collective houses (financed by the government)

Socio-cultural factors     Climate and environmental factors

Economic factors     Client preferences

Others: .....

8. In your opinion, is it important to consider participation of future inhabitants in the design of new houses?

Yes     No

Please, justify your answer:

.....  
.....  
.....

9. Have you already consulted with residents in the past?

Yes     No

10. Do you have any comments or suggestions about future house design in Algeria?

.....  
.....  
.....

Thank you for your assistance,

Mia Mehibel.

**Appendix 2: Questionnaire Survey for inhabitants.**

**Part one: Information about the owner.**

1. General information :

Address: .....

Sample No: .....

Dwelling type:

Courtyard       Selfbuilt       Apartment .

Other:.....

\*For Apartments only:

- a) Number of stories in the Block.....
- b) On which floors.....
- c) Number of apartments on same floor.....

2. Gender of the person whose answering :

Male                       Female

3. Household structure:

Nuclear household               Extended household

4. Number of persons in household:

2       3-4       5-8       more than 8

Other (please specify) .....

**Part two: Information about the housing estate.**

1. Work: How do you go to your work (University, school...)

Walking       by car       Bus

- Other:.....

2. What facilities are available on the estate?

Bus Stops       School       Medical Centre       Sport centre       Nursery

Super      Market       Mosque       other shops

3. How far are most of the facilities?

Facilities	Distance within:				
	Less than 100 m	100-500m	500m-1km	1km-2km	More than 2km
Bus Stops					
School					
Medical Centre					
Sport centre					
Nursery					
Super Market					
Other shops					
Mosque					

4. How many green spaces and trees that you have in the estate?

Many     Enough     Little     Nothing

5. Are there enough playground areas for children in the estate?

Yes     No

6. If no, where do your children play?

7. Are there squares or areas where residents grouped?

Yes     No

If no, do you prefer to have such places?

Yes     No

**Part three: Information about the house or the apartment.**

**1. COMFORT.**

**1.1. Spatial comfort**

1. Tenure: Is this flat:

Owner occupied?     Rented from council?     Rented privately?     Rent free?

2. Which organisation of the house do you prefer:

Central organisation with a courtyard.  Corridor.

Why?

**1.1.1. Size of the house:**

1. What do you think of the size of your home in terms of your family requirements?

Small  the right size  Spacious

2. How many rooms do you have?

Bedroom(s)  Living room  Dining Area

3. What extra room would you like to have? And how many?

4. Size of the different rooms of the house:

**A. The living rooms:**

Small  the right size  spacious.

-Do you find the shape convenient to arrange your furniture in the way you want to?

Yes  No

**B. The kitchen:**

Small  the right size  spacious

- Is there enough work space?

Yes  No

-Do you have enough space to arrange your equipments in the kitchen?

Yes  No

-If not, which equipments and where do you put them?

-Do you have a loggia with your kitchen?

Yes  No

-If yes, To what purpose do you (or would you) use the loggia?

**C. The bedrooms:**

Small  the right size  spacious

-Do you find the shape convenient to arrange your furniture in the way you want to?

Yes  No

-Are there any other activities holds in the bedrooms apart sleeping?

Yes  No

-If yes, which are?

-Are there any activities you cannot do in your house because there is not enough space?

Yes  No

-If yes, what are those activities?

**D. Balcony:**

-Do you have a balcony or terrace?

Yes  No

-For what purpose do you use your balcony?

Sitting  drying clothes  storage  nothing

-other.....

**1.2. Thermal comfort**

1. Do you feel comfortable in your house during summer?

Yes  No

I feel comfortable in these rooms:.....

I don t feel comfortable in these rooms:.....

-Do you have any cooling system in the house?

Yes  No

How many? And in which rooms?

.....

2. Do you feel comfortable in your house during winter?

Yes  No

I feel comfortable in these rooms:.....

I don't feel comfortable in these rooms:.....

-Do you have any heating system in the house?

Yes  No

3. How do you consider natural day lighting in your house?

Good  Satisfactory  Insufficient

-Do you have a window in each room?

Yes  No

-If No, which rooms that do not have a window?

.....

### 1.3. Acoustic comfort.

1. Do you find noise:

A Great Problem  A Slight problem  Not a problem

2. What sort of noises are problems?

Children  Traffic  Radio and T.V  Speaking of neighbours.

Others.....

### 1.4. Air Quality.

1. How do you consider ventilation in your house?

Good  Satisfactory  Insufficient

2. How do you consider air pollution in the estate?

A big problem  a slight problem  not a problem

Please explain:

3. When you are in your home, do you feel any smells from the outdoor?

Yes  No

What are these smells?

4. How do you consider humidity in your house?

High     Low     not a problem

**1.5. PRIVACY:**

1. Do you find your house:

Overlooked     Too cut off

-Other:.....

2. Can your visitors go straight to a separate reception room without passing through other private rooms?

Yes     No

3. Do you prefer to have such arrangement in your house?

Yes     No     No preferences

4. When you have a visitor in your house, do you feel comfortable about moving around the house?

Yes     No

**1.6. SECURITY.**

1. Has your home ever been broken into or stolen?

Yes     No

2. Has there been any attempted break in this building?

Yes     No

3. Do you take measures for security purposes?

Yes     No

4. What are these measures?

**II. ENERGY CONSUMPTION.**

1. How much do you pay every trimester in:

	Summer	winter
Electricity		
Gas		
Water		

2. Which of these items of home appliances do you own?

Washing machine     Water heater

A heater     Air conditioner

3. Which other appliances do you want to own in the future? And why?

**III. Housing preferences.**

1. How long have you been in this address?

.....

2. Are there any modifications that you have made in your house?

Yes     No

-If yes: what are these modifications?

3. What is the reason for these modifications?

4. Is there any other modification that you would like to make?

Yes     No

Why?

5. Do you want to move from this flat?

Yes  No

-Why?

6. Are you satisfied with your house?

Yes  No

7. If No, can you tell me what makes you dissatisfied with your house?

Location.     Aspect (external).     Area of house.  
 Arrangement of space (design).     High energy costs.  
 Type of neighbours.     Lack of comfort.

8. What type of dwelling would you prefer to live in if you had the option to choose?

Supply reasons:

.....  
.....  
.....

9. Do you prefer to participate in the design process of your house?

.....  
.....  
.....  
.....  
.....

10. Do you have any comments or suggestions about future house design?

.....  
.....  
.....  
.....  
.....

Thank you for your assistance, Mia Mehibel.

### Appendix 3: Samples of the Questionnaire Surveys' Responses.

**INTERVIEW POUR LES PROFESSIONNELS.**

**Première partie: Information personnelle.**

1. Sexe:  
 Male  Femelle

2. Age:  
 20-29  30-39  40-49  plus de 50

3. Occupation: Architecte

4. Promotion: l'un des doct.

**Deuxième partie: Information sur le secteur de l'urbanisme et de construction.**

5. Quesque vous pensez du secteur de l'urbanisme et de la construction en Algérie durant les dernières 50 années (après l'indépendance)?  
 Riche  satisfaisant  médiocre  
 Justifiez votre réponse s'il vous plaît:  
On arrive toujours pas à satisfaire la demande dans le secteur de la crise du logement.

6. Quels sont les facteurs que vous considérez dans la conception des projets:

a) Habitat individuel (financé par des particuliers):  
 Facteurs socio-culturelle  Facteurs Climatiques et environnemental.  
 Facteurs économique  Préférences du Client  
 Autre: \_\_\_\_\_

b) Habitat collectif (financé par l'état):  
 Facteurs socio-culturelle  Facteurs Climatiques et environnemental.  
 Facteurs économique  Préférences du Client  
 Autre: \_\_\_\_\_

7. Est ce que vous pensez que l'architecture moderne en Algérie est influencée par l'architecture européenne?  
 Oui  Non

1

Si oui, quels sont ces influences?  
Esthétiques

8. comment vous avez entendu du concept du développement durable?  
 Université  travail  media  
 Autre: \_\_\_\_\_

9. Est ce que vous avez une idée sur les objectives du developement durable?  
 Oui  Non  
 Si oui, a votre avis quels est le mot ou la phrase que décrit le batiment durable?  
 vert  économie d'énergie  adaptation au climat

10. Est-ce que vous pensez que le gouvernement Algérien fait des efforts pour la sensibilisation des citoyens et des professionnels au sujet du développement durable?  
 Oui  Non  
 -Comment? \_\_\_\_\_

11. A votre avis, entre ces deux types de maison qui est le plus durable?  
 Maison moderne  maison traditionnelles  
 Justifiez votre réponse s'il vous plaît:  
Elle est conçue justement pour durer dans le temps.

12. Entre ces deux types d'architecture (moderne et traditionnelle) en Algérie, lequel satisfait les besoins de la population locale, en terme de:  
 a. Confort.  
 > eclairage  
 Architecture moderne  architecture traditionnelle

2

> bruit  
 Architecture moderne  architecture traditionnelle

> ventilation  
 Architecture moderne  architecture traditionnelle

> espace  
 Architecture moderne  architecture traditionnelle

b. Prix  
 > Le cout de realisation  
 Architecture moderne  architecture traditionnelle

> La consommation énergétique  
 Architecture moderne  architecture traditionnelle

> Le cout de maintenance  
 Architecture moderne  architecture traditionnelle

13. Est ce que vous pensez que l'architecture traditionnelle respect les reglements de construction et de l'urbanisme en algerie?  
 Oui  Non

14. Est-ce que vous pensez qu il est important de considerer l'opinion du future habitants dans la conception des nouveaux projets d'habitation?  
 Oui  Non

15. Est-ce que vous avez déjà consulte avec des futures habitants?  
 Oui  Non

16. Commentaire ou suggestions pour la conception des futurs projets d'habitation en Algérie.  
Utilisation de l'énergie renouvelable dans la conception de futurs projets d'habitation afin de réduire leur consommation énergétique et l'utilisation de matériaux qui persistent dans le temps.

Merci pour votre assistance.

3

**Questionnaire pour les résidents.**

**Première partie: Information personnelle**

Adresse: Cité des 33 logts B5 r1  
 N° appartement: 111-03  
 Type de logement:  
 Maison a cour  Appartement  Autre.....

\*Pour les appartements seulement:  
 a) Nombre d'étages par bloc... D5  
 b) Etage... 1<sup>er</sup>  
 c) Nombre d'appartements par étage... 25

1. Sexe de la personne qui répond :  
 Male  Femelle

2. Structure du ménage:  
 Famille nucléaire  plusieurs ménages

3. Nombre de personnes du ménage:  
 2  3-4  5-8  plus de 8  
 Autre .....

**Deuxième partie: Information sur la cité résidentielle.**

1. Comment vous vous déplacez au travail (Université, école...)  
 A pieds  voiture  Bus  
 Autre .....

2. Quels sont les équipements disponibles dans la cité?  
 Arrêt de bus  école  Centre de santé  Salle de sport  
 Crèche  Super Marche  Autre magasin  Mosquée.

1

3. Quelle est la distance de la plus part de ces équipements?

Equipement	Distance			
	Moins de 100 m	100-500m	500m-1km	Plus de 2km
Arrêt de bus		<input checked="" type="checkbox"/>		
Ecole	<input checked="" type="checkbox"/>			
Centre de santé				<input checked="" type="checkbox"/>
Salle de sport			<input checked="" type="checkbox"/>	
Crèche				
Super Marche				
Autre magasin.		<input checked="" type="checkbox"/>		
Mosquée			<input checked="" type="checkbox"/>	

4. Combien d'espace verts et d'arbre dans la cité?  
 Beaucoup  assez juste  un peu  rien

5. Est ce qu'il y a assez d'espace de jeux d'enfants?  
 Oui  Non

6. Si non, ou vos enfants jouent?  
 [ ]

7. Est ce qu'il y a des espaces ou placettes ou les résidents peut se grouper ?  
 Oui  Non  
 Si Non, est ce que vous préférez d'avoir ce genre d'espace ?  
 Oui  Non

**Troisième partie: Information sur la maison ou l'appartement.**

**I. CONFORT**

**Confort spatial**

1. Possession: est ce que votre maison est:  
 Votre propriété.  Loué de l'état.  Loué du privé.  loué gratuitement.

2. Quelle est l'organisation que vous préférez:  
 Organisation central autour d'une cour.  Couloirs.

2

Pourquoi?  
 [ ]

**La taille de la maison:**

3. Qu'est-ce que vous pensez de la taille de votre maison en comparant au besoin de votre famille?  
 Petite  la taille exacte  spacieuse

4. Quel est le nombre de pièce dans votre maison?  
 Salon  chambre(s)  salle à manger.  
 Quelles sont les pièces que vous voulez avoir en plus? Combien?  
 [ ]

5. la taille des différentes pièces de la maison:

A. Salon:  
 Petit  la taille exacte  spacieux  
 Est ce que vous trouvez la forme convenable pour arranger votre meuble comme vous voulez?  
 Oui  Non

B. la cuisine:  
 Petite  la taille exacte  spacieuse  
 Est ce que vous avez assez d'espace de travail?  
 Oui  Non  
 Est ce que vous avez assez d'espace pour aménager l'électroménager de la cuisine?  
 Oui  Non  
 Sinon, ou vous mettez votre électroménager?  
 [ ]

Est-ce qu'il y a un loggia avec la cuisine?  
 Oui  Non

3

Si oui, pour quelle fonction vous utilisez le loggia?  
Je mets le réfrigérateur dedans.

Si non, est ce que vous préférez d'avoir un et pourquoi ?  
 [ ]

**C. Les chambres:**

Petite  la taille exacte  spacieuse

a. Est ce que vous trouvez la forme convenable pour arranger votre meuble comme vous voulez?  
 Oui  Non

b. Est ce qu'il y a d'autres activités que vous faites dans les chambres a part dormir?  
 Oui  Non

c. Si oui, quelles sont ces activités?  
 [ ]

d. Est ce qu'il y a d'autres activités que vous ne pouvez pas faire dans votre maison a cause de l'espace?  
 Oui  Non

e. Si oui, quelle sont ces activités?  
 [ ]

**D. Balcon:**

f. Est-ce que vous avez un balcon ou une terrasse?  
 Oui  Non

g. Pour quelle fonction vous utilisez le balcon?  
 S'asseoir  sécher le linge  rangement  rien  autre.....

4

• **Confort thermique**

6. Sentez-vous confortable dans votre maison pendant l'été?  
 Oui  Non  
 Je me sent confortable dans ces chambres: oui  
 Je ne me sent pas confortable dans ces chambres: \_\_\_\_\_  
 -Est-ce que vous avez un system de climatisation?  
 Oui  Non  
 Combien ? et dans quelle chambre?  
la couloir

7. Sentez-vous confortable dans votre maison pendant l'hiver?  
 Oui  Non  
 Je me sent confortable dans ces chambres: oui  
 Je ne me sent pas confortable dans ces chambres: \_\_\_\_\_  
 -Est-ce que vous avez un system de chauffage?  
 Oui  Non  
 Combien ? et dans quelle chambre?  
la couloir

8. Comment vous considerez l'éclairage naturel dans votre maison?  
 Bien  Satisfaisant  Insuffisant  
 -Est-ce que vous des fenêtres dans toutes les chambres?  
 Oui  Non  
 -Si Non, quelles sont les pièces qui n'ont pas de fenêtre?  
 \_\_\_\_\_

• **Confort Acoustique**

9. Vous trouvez le bruit:  
 Un grand problème  un petit problème  ce n'est pas un problème

10. Quelle sorte de bruit est un problème?  
 Enfants  circulation  Radio ou T.V  
 La voie des voisins. Autre: \_\_\_\_\_

5

• **Confort olfactif**

11. Comment vous considerez la ventilation dans votre maison?  
 Bien  Satisfaisante  Insuffisante

12. Comment vous considerez la pollution de l'air dans votre cite?  
 Un grand problème  un petit problème  ce n'est pas un problème  
 Expliquez, s'il vous plaît:  
l'air n'est pas pollué

13. Quand vous êtes dans votre maison, est ce que vous sentez des odeurs de l'environnement extérieure?  
 Oui  Non  
 Citez les odeurs s'il vous plaît:  
 \_\_\_\_\_

14. Comment vous considerez l'humidité dans votre maison?  
 Elevée  basse  ce n'est pas un problème

II. **INTIMITE:**

1. Vous trouvez votre maison:  
 Exposée  isolée  
 Autre: \_\_\_\_\_

2. Est-ce que vos invités peuvent aller directement au séjour sans passer a d'autre pièces privées?  
 Oui  Non

3. Est-ce que vous préférez d'avoir cette organisation dans votre maison?  
 Oui  Non  pas de preferences

4. Quand vous avez un invité, est ce que vous pouvez circuler à l'aise dans la maison?  
 Oui  Non

6

III. **SECURITE.**

1. Est-ce que votre maison jamais été cambriolée ou volé?  
 Oui  Non

2. Est ce qui l'y avait une tentative de violation dans le bâtiment?  
 Oui  Non

3. Est ce que vous avez pris des mesures de sécurité?  
 Oui  Non

4. Quelles sont ces mesures?  
les fenêtres et la porte d'entrée sont renforcées

IV. **CONSUMMATION D'ÉNERGIE.**  
 Combien vous payez en moyenne chaque trimestre en:

	ETE	HIVER
Electricité	2100,00	2200,00
Gas	600,00	1300,00
Eau	900,00	900,00

1. Lequel de ces électroménagers que vous possédez?  
 Machine à laver  chauffe bain  
 Climatiseur  chauffage

2. Quels sont les autres électroménagers que vous voulez posséder au future? Et pourquoi?  
 \_\_\_\_\_

V. **Les preferences.**

1. Depuis quand vous habitez ici?  
depuis 2 ans

2. Est ce que vous avez fait des modifications dans votre maison?  
 Oui  Non  
 Si oui: Quels sont ces modifications?  
je ai tout refais - carrelage, portes et fenêtres, plâtrage, salle de bain, cuisine, etc.

7

3. Quels sont les raisons pour faire ces modifications?  
les travaux de l'état sont mediocres

4. Est ce qu'il y a d'autre modification que vous voulez faire?  
 Oui  Non  
 Pourquoi?  
 \_\_\_\_\_

5. Est ce que vous voulez changer votre maison?  
 Oui  Non  
 Pourquoi?  
 \_\_\_\_\_

6. Est-ce que vous êtes satisfait par votre maison?  
 Oui  Non

7. Si votre réponse est Non, Quesque vous fait insatisfait par votre maison?  
 Location.  Aspect (extérieur).  Surface de la maison.  
 Conception.  La consommation élevée d'énergies.  
 Les voisins.  L'inconfort

8. Quel type de maison vouldiez-vous choisir (si vous avez le choix bien sûr)?  
je choisirai une maison individuelle

9. Est-ce que vous préférez de participer dans la conception de votre maison?  
oui je préfère de participer dans la conception de ma maison

10. Commentaire ou suggestions pour la conception des futurs projets d'habitation en Algérie.  
 \_\_\_\_\_

Merci pour votre assistance.

8

**Questionnaire pour les résidents.**

**Première partie: Information personnelle.**

Adresse: cité Nouvelle B.I. Nié-jijel

N° appartement: 09

Type de logement:

Maison à cour  Appartement  Autre.....

\*Pour les appartements seulement:

- a) Nombre d'étages par bloc...05..  
 b) Etage...05..  
 c) Nombre d'appartements par étage...02..

1. Sexe de la personne qui répond :

Male  Femelle

2. Structure du ménage:

Famille nucléaire  plusieurs ménages

3. Nombre de personnes du ménage:

2  3-4  5-8  plus de 8

Autre .....

**Deuxième partie: Information sur la cité résidentielle.**

1. Comment vous vous déplacez au travail (Université, école...)

A pieds  voiture  Bus

Autre .....

2. Quels sont les équipements disponibles dans la cité?

Arrêt de bus  école  Centre de santé  Salle de sport

Crèche  Super Marche  Autre magasin  Mosquée.

1

3. Quelle est la distance de la plus part de ces équipements?

Équipement	Distance				
	Moins de 100 m	100-500m	500m-1km	1km-5km	Plus de 5km
Arrêt de bus	<input checked="" type="checkbox"/>				
Ecole	<input checked="" type="checkbox"/>				
Centre de santé		<input checked="" type="checkbox"/>			
Salle de sport		<input checked="" type="checkbox"/>			
Crèche	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
Super Marche	<input checked="" type="checkbox"/>				
Autre magasin.	<input checked="" type="checkbox"/>				
Mosquée					

4. Combien d'espace verts et d'arbre dans la cité?

Beaucoup  assez juste  un peu  rien

5. Est ce qu'il y a assez d'espace de jeux d'enfants?

Oui  Non

6. Si non, ou vos enfants jouent?

Ils jouent dans la cour, mais de la maison.

7. Est ce qu'il y a des espaces ou placettes ou les résidents peut se grouper ?

Oui  Non

Si Non, est ce que vous préférez d'avoir ce genre d'espace ?

Oui  Non

**Troisième partie: Information sur la maison ou l'appartement.**

**I. CONFORT**

**Confort spatial**

1. Possession: est ce que votre maison est:

Votre propriété.  Loué de l'état.  Loué du privé.  loué gratuitement.

2. Quelle est l'organisation que vous préférez:

Organisation central autour d'une cour.  Couloirs.

2

Pourquoi?

pour avoir un grand espace pour faciliter le déplacement dans la maison.

**La taille de la maison:**

3. Qu'est-ce que vous pensez de la taille de votre maison en comparant au besoin de votre famille?

Petite  la taille exacte  spacieuse

4. Quel est le nombre de pièce dans votre maison?

Salon  chambre(s)  salle à manger.

Quelles sont les pièces que vous voulez avoir en plus? Combien?

Salle à manger et plus de chambre (4)

5. la taille des différentes pièces de la maison:

A. Salon:

Petit  la taille exacte  spacieux

Est ce que vous trouvez la forme convenable pour arranger votre meuble comme vous voulez?

Oui  Non

B. la cuisine:

Petite  la taille exacte  spacieuse

Est ce que vous avez assez d'espace de travail?

Oui  Non

Est ce que vous avez assez d'espace pour aménager l'électroménager de la cuisine?

Oui  Non

Si non, ou vous mettez votre électroménager?

dans la boîte, rangés dans les placards des chambres.

Est-ce qu'il y a un loggia avec la cuisine?

Oui  Non

3

Si oui, pour quelle fonction vous utilisez le loggia?

pour ranger des choses de cette - pour secher les vêtements.

Si non, est ce que vous préférez d'avoir un et pourquoi ?

**C. Les chambres:**

Petite  la taille exacte  spacieuse

a. Est ce que vous trouvez la forme convenable pour arranger votre meuble comme vous voulez?

Oui  Non

b. Est ce qu'il y a d'autres activités que vous faites dans les chambres a part dormir ?

Oui/Non

c. Si oui, quelles sont ces activités?

course - lire - ranger les affaires - étudier -

d. Est ce qu'il y a d'autres activités que vous ne pouvez pas faire dans votre maison a cause de l'espace?

Oui  Non

e. Si oui, quelle sont ces activités?

faire du sport. on ne peut pas bouger facilement. - le ménage -

**D. Balcon:**

f. Est-ce que vous avez un balcon ou une terrasse?

Oui  Non

g. Pour quelle fonction vous utilisez le balcon?

S'asseoir  sécher le linge  rangement  rien  autre.....

4

• **Confort thermal**

6. Sentez-vous confortable dans votre maison pendant l'été?  
 Oui  Non  
 Je me sent confortable dans ces chambres:.....  
 X Je ne me sent pas confortable dans ces chambres:.....  
 -Est-ce que vous avez un systeme de climatisation ?  
 Oui  Non  
 Combien ? et dans quelle chambre ?  
 .....

7. Sentez-vous confortable dans votre maison pendant l'hiver?  
 Oui  Non  
 X Je me sent confortable dans ces chambres:.....  
 Je ne me sent pas confortable dans ces chambres:.....  
 -Est-ce que vous avez un systeme de chauffage ?  
 Oui  Non  
 Combien ? et dans quelle chambre ?  
 .....

8. Comment vous considerez l'éclairage naturel dans votre maison?  
 Bien  Satisfaisant  Insuffisant  
 -Est-ce que vous des fenetres dans toutes les chambres ?  
 Oui  Non  
 -Si Non, quelles sont les pieces qui n'ont pas de fenetre ?  
 .....

• **Confort Acoustique**

9. Vous trouvez le bruit:  
 Un grand probleme  un petit probleme  ce n'est pas un probleme  
 10. Quelle sorte de bruit est un probleme?  
 Enfants  circulation  Radio ou T.V  
 La voie des voisins. Autre : .....

5

• **Confort olfactif**

11. Comment vous considerez la ventilation dans votre maison?  
 Bien  Satisfaisante  Insuffisante  
 12. Comment vous considerez la pollution de l'air dans votre cite?  
 Un grand probleme  un petit probleme  ce n'est pas un probleme  
 Expliquez, s'il vous plait:  
 .....

13. Quand vous êtes dans votre maison, est ce que vous sentez des odeurs de l'environnement extérieure?  
 Oui  Non  
 Citez les odeurs s'il vous plait:  
 .....

14. Comment vous considerez l'humidité dans votre maison?  
 Elevée  basse  ce n'est pas un probleme

II. **INTIMITE:**

1. Vous trouvez votre maison:  
 Exposé  isolée  
 Autre:.....

2. Est-ce que vos invites peuvent aller directement au séjour sans passer d'autres pieces privées?  
 Oui  Non

3. Est-ce que vous préférez d'avoir cette organisation dans votre maison ?  
 Oui  Non  pas de preferences

4. Quand vous avez un invité, est ce que vous pouvez circuler à l'aise dans la maison?  
 Oui  Non

6

III. **SECURITE.**

1. Est-ce que votre maison jamais été cambriolée ou volé?  
 Oui  Non

2. Est ce qui y avait une tentative de violation dans le bâtiment?  
 Oui  Non

3. Est ce que vous avez prie des mesures de sécurité?  
 Oui  Non

4. Quelles sont ces mesures?  
 faire la porte du bloc et de chaque nuit avec une barre precis.

IV. **CONSOMMATION D'ÉNERGIE.**  
 Combien vous payez en moyenne chaque trimestre en:

	Summer	winter
Electricite	1894.85	1876.96
Gaz	587.00	539.50
Eau	2099.70	288.07

1. Lequel de ces électroménagers que vous possédez?  
 Machine à laver  chauffe bain  
 Climatiseur  chauffage

2. Quels sont les autres électroménagers que vous voulez posséder à l'avenir? Et pourquoi?  
 climatiseur.

V. **Les preferences.**

1. Depuis quand vous habitez ici?  
 Depuis 25 ans.

2. Est ce que vous avez fait des modifications dans votre maison?  
 Oui  Non  
 Si oui: Quels sont ces modifications?  
 .....

7

3. Quels sont les raisons pour faire ces modifications?  
 .....

4. Est ce qu'il y a d'autre modification que vous voulez faire?  
 Oui  Non  
 Pourquoi?  
 .....

5. Est ce que vous voulez changer votre maison?  
 Oui  Non  
 Pourquoi?  
 Il n'y a pas assez d'espace.

6. Est-ce que vous êtes satisfait par votre maison?  
 Oui  Non

7. Si votre réponse est Non, Quelles vous fait insatisfait par votre maison?  
 Location.  Aspect (extérieur).  Surface de la maison.  
 Conception.  La consommation élevée d'énergies.  
 Les voisins.  L'inconfort

8. Quel type de maison voulez-vous choisir (si vous avez le choix bien sûr)?  
 une villa

9. Est-ce que vous préférez de participer dans la conception de votre maison?  
 oui je prefere participer

10. Commentaire ou suggestions pour la conception des futurs projets d'habitation en Algérie.  
 plus d'appareil et surtout de salle de bain et de cuisine plus de chambre

Merci pour votre assistance.

8

**Questionnaire pour les résidents.**

**Première partie: Information personnelle.**

Adresse: *cité 70 Angla... Magyphiane...*

N° appartement: *03*

Type de logement:

Maison a cour  Appartement  Autre.....

\*Pour les appartements seulement:

- a) Nombre d'étages par bloc... *05*
- b) Etage... *02*
- c) Nombre d'appartements par étage... *03*

1. Sexe de la personne qui répond :

Male  Femelle

2. Structure du ménage:

Famille nucléaire  plusieurs ménages

3. Nombre de personnes du ménage:

2  3-4  5-8  plus de 8

Autre.....

**Deuxième partie: Information sur la cite résidentielle.**

1. Comment vous vous déplacez au travail (Université, école...)

A pieds  voiture  Bus

Autre.....

2. Quels sont les équipements disponibles dans la cite?

Arrêt de bus  école  Centre de sante  Salle de sport

Crèche  Super Marche  Autre magasin  Mosquée.

3. Quelle est la distance de la plus part de ces équipements?

Équipement	Distance				
	Moins de 100 m	100-500m	500m-1km	1km-2km	Plus de 2km
Arrêt de bus	X				
Ecole	X				
Centre de sante					
Salle de sport					
Crèche					
Super Marche					
Autre magasin.					
Mosquée					

4. Combien d'espace verts et d'arbre dans la cite?

Beaucoup  assez juste  un peu  rien

5. Est ce qu'il y a assez d'espace de jeux d'enfants?

Oui  Non

6. Si non, ou vos enfants jouent?

*A la main, en dehors devant de bloc*

7. Est ce qu'il y a des espaces ou placettes ou les résidents peut se grouper ?

Oui  Non

Si Non, est ce que vous preferez d'avoir ce genre d'espace ?

Oui  Non

**Troisième partie: Information sur la maison ou l'appartement.**

**I. CONFORT**

**Confort spatial**

1. Possession: est ce que votre maison est:

Votre propriété.  Loué de l'état.  Loué de privé.  loué gratuitement.

2. Quelle est l'organisation que vous préférez:

Organisation central autour d'une cour.  Couloirs.

Pourquoi?

*c'est plus spacieux, plus familiale et plus confortable*

**La taille de la maison:**

3. Qu'est-ce que vous pensez de la taille de votre maison en comparant au besoin de votre famille?

Petite  la taille exacte  spacieuse

4. Quel est le nombre de pièce dans votre maison?

Salon  chambre(s)  salle à manger.

Quelles sont les pièces que vous voulez avoir en plus? Combien?

*- Salle à manger  
- chambre pour enfants  
- chambre pour invités*

5. la taille des différentes pièces de la maison:

A. Salon:

Petit  la taille exacte  spacieux

Est ce que vous trouvez la forme convenable pour arranger votre meuble comme vous voulez?

Oui  Non

B. la cuisine:

Petite  la taille exacte  spacieuse

Est ce que vous avez assez d'espace de travail?

Oui  Non

Est ce que vous avez assez d'espace pour aménager l'électroménager de la cuisine?

Oui  Non

Sinon, ou vous mettez votre électroménager?

*au loggia de la cuisine*

Est-ce qu'il y a un loggia avec la cuisine?

Oui  Non

Si oui, pour quelle fonction vous utilisez le loggia?

*- Equipements électroménagers - machine à laver  
- bouteille à gaz - allume à eau*

Si non, est ce que vous preferez d'avoir un et pourquoi ?

**C. Les chambres:**

Petite  la taille exacte  spacieuse

a. Est ce que vous trouvez la forme convenable pour arranger votre meuble comme vous voulez?

Oui  Non

b. Est ce qu'il y a d'autres activités que vous faites dans les chambres a part dormir ?

Oui/Non

c. Si oui, quelles sont ces activités?

*[Empty box for answer]*

d. Est ce qu'il y a d'autres activités que vous ne pouvez pas faire dans votre maison a cause de l'espace?

Oui  Non

e. Si oui, quelle sont ces activités?

*- Avoir ou mettre un bureau pour travailler  
- recevoir des invités  
- partager le spat ou aménager un espace pour enfant*

**D. Balcon:**

f. Est-ce que vous avez un balcon ou une terrasse?

Oui  Non

g. Pour quelle fonction vous utilisez le balcon?

S'asseoir  sécher le linge  rangement  rien  autre.....

• **Confort thermique**

6. Sentez-vous confortable dans votre maison pendant l'été?  
 Oui  Non

Je me sent confortable dans ces chambres: .....

Je ne me sent pas confortable dans ces chambres: *a cause de la chaleur et de l'espace*

-Est-ce que vous avez un systeme de climatisation?  
 Oui  Non

Combien ? et dans quelle chambre ?

.....

7. Sentez-vous confortable dans votre maison pendant l'hiver?  
 Oui  Non

Je me sent confortable dans ces chambres: .....

Je ne me sent pas confortable dans ces chambres: *a cause du froid et du manque de gaz*

-Est-ce que vous avez un systeme de chauffage?  
 Oui  Non

Combien ? et dans quelle chambre ?

.....

8. Comment vous considerez l'éclairage naturel dans votre maison?  
 Bien  Satisfaisant  Insuffisant

-Est-ce que vous des fenetres dans toutes les chambres?  
 Oui  Non

-Si Non, quelles sont les pièces qui n'ont pas de fenetre?  
 .....

• **Confort Acoustique**

9. Vous trouvez le bruit:  
 Un grand problème  un petit problème  ce n'est pas un problème

10. Quelle sorte de bruit est un problème?  
 Enfants  circulation  Radio ou T.V  
 La voie des voisins. Autre : .....

5

• **Confort olfactif**

11. Comment vous considerez la ventilation dans votre maison?  
 Bien  Satisfaisante  Insuffisante

12. Comment vous considerez la pollution de l'air dans votre cite?  
 Un grand problème  un petit problème  ce n'est pas un problème

Expliquez, s'il vous plait:  
 - espaces devant les bacs non aménagés en espace vert.  
 - Pas de parking pour véhicules; tout odeur qui se dégage de ces véhicules expose les habitants au danger de la pollution

13. Quand vous êtes dans votre maison, est-ce que vous sentez des odeurs de l'environnement extérieure?  
 Oui  Non

Citez les odeurs s'il vous plait:  
 - les poubelles.  
 - Echappements des véhicules.  
 - Eau usée et

14. Comment vous considerez l'humidité dans votre maison?  
 Elevée  basse  ce n'est pas un problème

II. **INTIMITE:**

1. Vous trouvez votre maison:  
 Exposée  isolée

Autre: .....

2. Est-ce que vos invites peuvent aller directement au séjour sans passer d'autre pièces privées?  
 Oui  Non

3. Est-ce que vous préférez d'avoir cette organisation dans votre maison?  
 Oui  Non  pas de preferences

4. Quand vous avez un invité, est-ce que vous pouvez circuler à l'aise dans la maison?  
 Oui  Non

6

III. **SECURITE.**

1. Est-ce que votre maison jamais été cambriolée ou volé?  
 Oui  Non

2. Est-ce qu'il y avait une tentative de violation dans le bâtiment?  
 Oui  Non

3. Est-ce que vous avez pris des mesures de sécurité?  
 Oui  Non

4. Quelles sont ces mesures?  
 - Porte métallique  
 - double serrure  
 - Barreaux

IV. **CONSOMMATION D'ÉNERGIE.**

Combien vous payez en moyenne chaque trimestre en:

	Summer	winter
Electricité	1100,00	1300,00
Gaz	(Pas de gaz et ville)	
Eau	300,00	4500,00

1. Lequel de ces électroménagers que vous possédez?  
 Machine à laver  chauffe bain  
 Climatiseur  chauffage (à gaz butan)

2. Quels sont les autres électroménagers que vous voulez posséder au future? Et pourquoi?  
 - Climatiseur (à cause de la chaleur)  
 - Pôchain (étant une femme active, cela me fait gagner du temps pour préparer des plats)

V. **Les preferences.**

1. Depuis quand vous habitez ici?  
 ..... (20) ans.

2. Est-ce que vous avez fait des modifications dans votre maison?  
 Oui  Non

Si oui: Quels sont ces modifications?  
 - Aménagement de la cuisine, des toilettes et de la salle de bain

7

3. Quels sont les raisons pour faire ces modifications?  
 - être plus confortable.  
 - Avoir plus d'espace  
 - mieux aménagement des meubles

4. Est-ce qu'il y a d'autre modification que vous voulez faire?  
 Oui  Non

Pourquoi?  
 - Toujours par manque d'espace

5. Est-ce que vous voulez changer votre maison?  
 Oui  Non

Pourquoi?  
 Mein vivre et être plus à l'aise.

6. Est-ce que vous êtes satisfait par votre maison?  
 Oui  Non

7. Si votre réponse est Non, Quelque vous fait insatisfait par votre maison?  
 Location.  Aspect (extérieur).  Surface de la maison.  
 Conception.  La consommation élevée d'énergies.  
 Les voisins.  L'inconfort

8. Quel type de maison voulez-vous choisir (si vous avez le choix bien sûr)?  
 L.P.A

9. Est-ce que vous préférez de participer dans la conception de votre maison?  
 Oui, car je suis la mieux placé pour désigner les chambres ou toute pièce à aménager et de sorte que ce soit en accord avec moi

10. Commentaire ou suggestions pour la conception des futurs projets d'habitation en Algérie.  
 - création de ces espaces vert et aménagés pour enfants  
 - standardiser les façades extérieures des cités (à l'instar de celle des villes) de sorte de préserver l'identité de chaque cité  
 - un mur en béton pour plus de sécurité

Merci pour votre assistance.

8



**Confort thermique**

6. Sentez-vous confortable dans votre maison pendant l'été?  
 Oui  Non  
 Je me sens confortable dans ces chambres: .....  
 Je ne me sens pas confortable dans ces chambres: .....  
 -Est-ce que vous avez un système de climatisation?  
 Oui  Non  
 Combien? et dans quelle chambre? .....

7. Sentez-vous confortable dans votre maison pendant l'hiver?  
 Oui  Non  
 Je me sens confortable dans ces chambres: .....  
 Je ne me sens pas confortable dans ces chambres: .....  
 -Est-ce que vous avez un système de chauffage?  
 Oui  Non  
 Combien? et dans quelle chambre? *3 de chef chambre*

8. Comment vous considérez l'éclairage naturel dans votre maison?  
 Bien  Satisfaisant  Insuffisant *le Bien*  
 -Est-ce que vous des fenêtres dans toutes les chambres?  
 Oui  Non *Petit le fenêtre*  
 -Si Non, quelles sont les pièces qui n'ont pas de fenêtre? *Hiver Insuffisant*

**Confort Acoustique**

9. Vous trouvez le bruit:  
 Un grand problème  un petit problème  ce n'est pas un problème

10. Quelle sorte de bruit est un problème?  
 Enfants  circulation  Radio ou T.V.  
 La voie des voisins. Autre: .....

5

**Confort olfactif**

11. Comment vous considérez la ventilation dans votre maison?  
 Bien  Satisfaisante  Insuffisante

12. Comment vous considérez la pollution de l'air dans votre cité?  
 Un grand problème  un petit problème  ce n'est pas un problème  
 Expliquez, s'il vous plaît: *Il y a le vent*

13. Quand vous êtes dans votre maison, est-ce que vous sentez des odeurs de l'environnement extérieure?  
 Oui  Non  
 Citez les odeurs s'il vous plaît: *regard*

14. Comment vous considérez l'humidité dans votre maison?  
 Elevée  basse  ce n'est pas un problème

**II. INTIMITE:**

1. Vous trouvez votre maison:  
 Exposée  isolée  
 Autre: .....

2. Est-ce que vos invités peuvent aller directement au séjour sans passer à d'autres pièces privées?  
 Oui  Non

3. Est-ce que vous préférez d'avoir cette organisation dans votre maison?  
 Oui  Non  pas de préférences

4. Quand vous avez un invité, est-ce que vous pouvez circuler à l'aise dans la maison?  
 Oui  Non

6

**III. SECURITE.**

1. Est-ce que votre maison jamais été cambriolée ou volé?  
 Oui  Non

2. Est-ce qu'il y avait une tentative de violation dans le bâtiment?  
 Oui  Non

3. Est-ce que vous avez pris des mesures de sécurité?  
 Oui  Non

4. Quelles sont ces mesures? .....

**IV. CONSOMMATION D'ENERGIE.**  
 Combien vous payez en moyenne chaque trimestre en:

	ETE	HIVER
Electricite	<i>950000</i>	<i>105000</i>
Gaz	<i>1</i>	<i>1</i>
Eau	<i>700</i>	<i>700</i>

1. Lequel de ces électroménagers que vous possédez?  
 Machine à laver  chauffe bain  
 Climatiseur  chauffage

2. Quels sont les autres électroménagers que vous voulez posséder au futur? Et pourquoi?  
 .....

**V. Les preferences.**

1. Depuis quand vous habitez ici?  
*18 ans*

2. Est-ce que vous avez fait des modifications dans votre maison?  
 Oui  Non *- projet de rehabilitation*  
 -Si oui: Quels sont ces modifications?  
*sejour clair avec un la ch.*

7

*changer l'orientation de la table*

3. Quels sont les raisons pour faire ces modifications?  
 .....

4. Est-ce qu'il y a d'autres modifications que vous voulez faire?  
 Oui  Non  
 Pourquoi? *revenir à l'état d'avant*

5. Est-ce que vous voulez changer votre maison?  
 Oui  Non  
 Pourquoi? .....

6. Est-ce que vous êtes satisfait par votre maison?  
 Oui  Non

7. Si votre réponse est Non, Quelles vous fait insatisfait par votre maison?  
 Location.  Aspect (extérieur).  Surface de la maison.  
 Conception.  La consommation élevée d'énergies.  
 Les voisins.  L'inconfort

8. Quel type de maison voulez-vous choisir (si vous avez le choix bien sûr)?  
*maison a vast a dar*

9. Est-ce que vous préférez de participer dans la conception de votre maison?  
*En en ma d'avant sur l'idée*

10. Commentaire ou suggestions pour la conception des futurs projets d'habitation en Algérie.  
*maison plus grande*

Merci pour votre assistance,

8

**Questionnaire pour les résidents.**

**Première partie: Information personnelle.**

Adresse: Avenue Tahar el Mokhtar - aéroport TJS 1

N° appartement: .....

Type de logement:

- Maison à cour     Appartement     Autre... maison individuelle sans cour

\*Pour les appartements seulement:

- a) Nombre d'étages par bloc.....  
 b) Etage.....  
 c) Nombre d'appartements par étage.....

1. Sexe de la personne qui répond :

- Male     Femelle

2. Structure du ménage:

- Famille nucléaire     plusieurs ménages

3. Nombre de personnes du ménage:

- 2     3-4     5-8     plus de 8

Autre .....

**Deuxième partie: Information sur la cité résidentielle.**

1. Comment vous vous déplacez au travail (Université, école...)

- A pieds     voiture     Bus

Autre .....

2. Quels sont les équipements disponibles dans la cité?

- Arrêt de bus  école     Centre de santé  Salle de sport

- Crèche     Super Marche  Autre magasin  Mosquée.

3. Quelle est la distance de la plus part de ces équipements?

Equipement	Distance				
	Moins de 100 m	100-500m	500m-1km	1km-2km	Plus de 2km
Arrêt de bus		X			
Ecole	X				
Centre de santé			X		
Salle de sport	X				
Crèche	X				
Super Marche					
Autre magasin.	X				
Mosquée		X			

4. Combien d'espace verts et d'arbre dans la cité?

- Beaucoup     assez juste     un peu     rien

5. Est ce qu'il y a assez d'espace de jeux d'enfants?

- Oui     Non

6. Si non, ou vos enfants jouent?

dans leurs maisons

7. Est ce qu'il y a des espaces ou placettes ou les résidents peut se grouper ?

- Oui     Non

Si Non, est ce que vous préférez d'avoir ce genre d'espace ?

- Oui     Non

**Troisième partie: Information sur la maison ou l'appartement.**

**I. CONFORT**

**Confort spatial**

1. Possession: est ce que votre maison est:

- Votre propriété.     Loué de l'état.     Loué de privé.     loué gratuitement.

2. Quelle est l'organisation que vous préférez:

- Organisation central autour d'une cour.     Couloirs.

Pourquoi?

Je préfère avoir un couloir pour un meilleur confort thermique surtout pendant l'hiver.

**La taille de la maison:**

3. Qu'est-ce que vous pensez de la taille de votre maison en comparant au besoin de votre famille?

- Petite     la taille exacte  spacieuse

4. Quel est le nombre de pièce dans votre maison?

- Salon     chambre(s)     salle à manger.

Quelles sont les pièces que vous voulez avoir en plus? Combien?

.....

5. la taille des différentes pièces de la maison:

A. Salon:

- Petit     la taille exacte  spacieux

Est ce que vous trouvez la forme convenable pour arranger votre meuble comme vous voulez?

- Oui     Non

B. la cuisine:

- Petite     la taille exacte  spacieuse

Est ce que vous avez assez d'espace de travail?

- Oui     Non

Est ce que vous avez assez d'espace pour aménager l'électroménager de la cuisine?

- Oui     Non

Sinon, ou vous mettez votre électroménager?

.....

Est-ce qu'il y a un loggia avec la cuisine?

- Oui     Non

Si oui, pour quelle fonction vous utilisez le loggia?

.....

Si non, est ce que vous préférez d'avoir un et pourquoi ?

Je préfère ne pas l'avoir parce que la cuisine est spacieuse et l'existence d'un loggia est inutile.

**C. Les chambres:**

- Petite     la taille exacte  spacieuse

a. Est ce que vous trouvez la forme convenable pour arranger votre meuble comme vous voulez?

- Oui     Non

b. Est ce qu'il y a d'autres activités que vous faites dans les chambres a part dormir ?

- Oui/Non

c. Si oui, quelles sont ces activités?

.....

d. Est ce qu'il y a d'autres activités que vous ne pouvez pas faire dans votre maison a cause de l'espace?

- Oui     Non

e. Si oui, quelle sont ces activités?

.....

**D. Balcon:**

f. Est-ce que vous avez un balcon ou une terrasse?

- Oui     Non

g. Pour quelle fonction vous utilisez le balcon?

- S'asseoir     sécher le linge     rangement     rien     autre.....

• **Confort thermal**

6. Sentez-vous confortable dans votre maison pendant l'été?  
 Oui  Non  
 Je me sent confortable dans ces chambres: *salon - salle à manger*  
 Je ne me sent pas confortable dans ces chambres: *les chambres et la cuisine.*  
 -Est-ce que vous avez un system de climatisation ?  
 Oui  Non  
 Combien ? et dans quelle chambre ?  
*Le salon*

7. Sentez-vous confortable dans votre maison pendant l'hiver?  
 Oui  Non  
 Je me sent confortable dans ces chambres: *les chambres - la cuisine*  
 Je ne me sent pas confortable dans ces chambres: *salon - salle à manger*  
 -Est-ce que vous avez un system de chauffage ?  
 Oui  Non  
 Combien ? et dans quelle chambre ?  
*chauffage central dans toutes les pièces*

8. Comment vous considérez l'éclairage naturel dans votre maison?  
 Bien  Satisfaisant  Insuffisant  
 -Est-ce que vous des fenêtres dans toutes les chambres ?  
 Oui  Non  
 -Si Non, quelles sont les pièces qui n'ont pas de fenêtre ?  
 .....

• **Confort Acoustique**

9. Vous trouvez le bruit:  
 Un grand problème  un petit problème  ce n'est pas un problème

10. Quelle sorte de bruit est un problème?  
 Enfants  circulation  Radio ou T.V  
 La voie des voisins. Autre : .....

• **Confort olfactif**

11. Comment vous considérez la ventilation dans votre maison?  
 Bien  Satisfaisante  Insuffisante

12. Comment vous considérez la pollution de l'air dans votre cite?  
 Un grand problème  un petit problème  ce n'est pas un problème  
 Expliquez, s'il vous plait:  
 \_\_\_\_\_

13. Quand vous êtes dans votre maison, est ce que vous sentez des odeurs de l'environnement extérieure?  
 Oui  Non  
 Citez les odeurs s'il vous plait:  
 \_\_\_\_\_

14. Comment vous considérez l'humidité dans votre maison?  
 Elevée  basse  ce n'est pas un problème

II. **INTIMITE:**

1. Vous trouvez votre maison:  
 Exposée  isolée  
 Autre: .....

2. Est-ce que vos invites peuvent aller directement au séjour sans passer a d'autre pièces privées?  
 Oui  Non

3. Est-ce que vous préférez d'avoir cette organisation dans votre maison ?  
 Oui  Non  pas de preferences

4. Quand vous avez un invite, est ce que vous pouvez circuler à l'aise dans la maison?  
 Oui  Non

III. **SECURITE.**

1. Est-ce que votre maison jamais été cambriolée ou volé?  
 Oui  Non

2. Est ce qu'il y avait une tentative de violation dans le bâtiment?  
 Oui  Non

3. Est ce que vous avez prie des mesures de sécurité?  
 Oui  Non

4. Quelles sont ces mesures?  
*Barreaudage pour la porte d'entrée et fenêtres*

IV. **CONSUMMATION D'ÉNERGIE.**  
 Combien vous payez en moyenne chaque trimestre en:

	ETE	HIVER
Electricite	2000 DA	2000 DA
Gaz	1000 DA	4000 DA
Eau	5000 DA	5000 DA

1. Lequel de ces électroménagers que vous possédez?  
 Machine à laver  chauffe bain  
 Climatiseur  chauffage

2. Quels sont les autres électroménagers que vous voulez posséder au future? Et pourquoi?  
 \_\_\_\_\_

V. **Les preferences.**

1. Depuis quand vous habitez ici?  
*12 ans*

2. Est ce que vous avez fait des modifications dans votre maison?  
 Oui  Non  
 Si oui: Quels sont ces modifications?  
 \_\_\_\_\_

3. Quels sont les raisons pour faire ces modifications?  
 \_\_\_\_\_

4. Est ce qu'il y a d'autre modification que vous voulez faire?  
 Oui  Non  
 Pourquoi?  
 \_\_\_\_\_

5. Est ce que vous voulez changer votre maison?  
 Oui  Non  
 Pourquoi?  
 \_\_\_\_\_

6. Est-ce que vous êtes satisfait par votre maison?  
 Oui  Non

7. Si votre réponse est Non, Quesque vous fait insatisfait par votre maison?  
 Location.  Aspect (extérieur).  Surface de la maison.  
 Conception.  La consommation élevée d'énergies.  
 Les voisins.  L'inconfort

8. Quel type de maison voulez-vous choisir (si vous avez le choix bien sûr)?  
*une maison individuelle avec une organisation central autour d'un hall*

9. Est-ce que vous préférez de participer dans la conception de votre maison?  
 oui  
 \_\_\_\_\_

10. Commentaire ou suggestions pour la conception des futurs projets d'habitation en Algérie.  
*intégration de concepts de developpement durable dans l'habitat, pour diminuer la consommation d'énergie, l'organisation des pièces autour d'un hall.*

Merci pour votre assistance,

# Sustainability and the Urban Planning Context: Housing Development in Algeria

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## ABSTRACT

*This paper describes research into the development of housing in Algeria. It focuses on the history of traditional dwellings and the importance of outdoor space located inside the building: typically in the form of a courtyard. Courtyard dwellings in the city of Constantine are examined in some detail. The rapid urbanisation process taking place in Algeria in recent years together with difficulties in the planning system since colonial times has caused difficulties in responding to housing needs. The concentration of the population in smaller areas of cities has led to the need for more compact yet comfortable dwellings. The paper describes how the situation might be dealt with in the township of Jijel. A number of stakeholders are being consulted and the key results of in-depth interviews with architects are reported. The findings from the review of the existing housing areas and survey are then interpreted to make suggestions for development in the future.*

*Keywords: housing, urban, courtyards, design, Algeria*

## 1. INTRODUCTION

Algeria has experienced a number of invasions and colonisations through history and this has brought new peoples and new cultures to the area with consequently new commercial and demographic inputs. These have combined with the already rich variation created by climatic regions and traditional cultures to produce a wide variety of traditional dwelling form.

In modern interpretations of architectural history, traditional architecture is often considered to be an expression of sustainability as previous generations were forced by circumstance, to build in harmony with nature and climate. Further the products were matched to cultural and social values in a much more linked way than generally occurs in the present day (Makani and Talebi, 2011). As a result traditional settlements are often considered a source of sustainable design principles because they were built using locally available materials, and with respect to thermal comfort and cultural needs of the local community (Bouchair and Dupagne, 2003).

An interesting facet of many traditional housing designs was the attempt to have some kind of outdoor space indoors; the most successful exemplar of which is the courtyard house. Courtyard houses can have many beneficial attributes – in cultural terms and also in providing the means to reduce discomfort associated with climate.

In modern dwellings there is often an attempt to bring together elements of tradition together with modern needs and also to match to the needs or urbanisation. In rapid urbanisation it is frequently the need to produce smaller and more densely packed accommodation and in such circumstances the ability to create any kind of courtyard environment is severely limited. One way of creating some kind of

outdoor-indoor space is through the provision of individual balconies. Balconies can be left open or can be enclosed.

This paper consists of three main components: firstly examples of traditionally designed dwellings which have been researched are described and evaluated; secondly particular examples of the courtyard house are examined in more detail; and thirdly, the attitudes of architects to sustainability and the ability of current urban and housing design policies to meet needs is reported following interviews.

## **2. TRADITIONAL DWELLING TYPES**

Examples of older style traditional houses in Algeria according to Benmatti (1982) can often be divided into three categories: courtyard houses in the towns of north of the country which can be seen in the medina of Constantine for example; housing to be found in the rural and semi-urban areas of the North (this form of housing is less homogeneous than the first category and includes the example of Kabylia); and a third category associated with housing settlements in the South; examples being M'zab, Souf and Hoggar.

It is interesting to note in the following descriptions how the old styles of dwelling accommodated social and cultural needs whilst also dealing with the excesses of the climate. Some dwellings had only private interior space; some had both private and more public interior space; and in some cases the means of achieving all requirements was the use of a courtyard.

### **2.1 The Kabylia House**

The Kabylia Berber villages are situated in the summit, slopes of mountains or in high plateaus where a dense population live from land exploitation. Topography and climate are the factors that determine spatial structure of the village, streets and alleys which follow the geographic configuration of the site. The urban fabric is often constrained by a circular road around the summits of hills, and the houses or 'Axxam' are organised along radiants or alleys that are perpendicular to the circular road. The dwellings are often grouped and link to each other to form a larger family house.

The family house shelters the whole extended family, with the overall dwelling extended by the construction of new houses sometimes in the courtyards of the parent's house. In these traditional forms where space is not limited in the same way as in modern development, two or three generations may live together and form a sub-quarter (Toubal and Dahli, 2009).

In such rudimentary houses the family, its animals, its furniture, artifacts, equipment and products all come together (Maunier, 1926). Humans and animals are juxtaposed with minimal vertical or horizontal separation. The dwelling typically had three different spaces: a high living room for people with a fireplace, a low stable area for animals and water storage, and a shed for faring equipment and crops. The rooms are used by both male and female as the men typically spend the whole day outside working on the land and only come to the house to eat and sleep. The relationship between public and private space is not well determined in the plan as the house is effectively considered as a private place.

In Kabylia houses, high humidities can be found in spaces and activities related to water such as the kitchen and bathrooms. The Brasier or 'Kanun' occupied the driest places (Loeckx, 1998). The courtyard in the kabylia house is located exterior to the house where traditional summer activities such as pottery making are performed.

The house has a rectangular form and the dimensions are typically: exterior 7 to 7.5m length and approximately 5m wide with wall-height of about 3.5m walls. The dimension can vary depending on the needs of families and the wealth or otherwise of the household. The external walls of dwellings are thick and are normally constructed without windows and thus permit protection of the interior house from cold in winter and heat in summer; the only opening is the door. The walls are constructed from local stone and the roofs have two slopes and generally use roman tiles or clay. The structural frame is based on wooden Ash beams and olive branches, and is supported by its low side walls (Maunier, 1926).

### **2.2 Soufi House**

The traditional houses of Oued Souf are known as Soufi Houses. The Soufis or the inhabitants of Oued Souf were originally from Yemen; looking for water and better climatic living conditions, they crossed Egypt and Tunisia to settle in Oued Souf a city in the Algerian Sahara which borders Tunisia and Libya. The city is 620 km southeast of the capital Algiers. The city is located within the Oriental Grand

Erg (Great East Sand Sea).

Oued Souf is known as the 'city of a thousand and one domes' for its particular architecture characterised by the uniformity of styles using cupolas, domes and vaults. The old city is situated in the city centre and surrounded by three main roads, which separate the traditional urban fabric from the new town. The old city also exhibits a traditional architecture showing a compact urban structure which is characterised by a dense network of narrow twisting alleys, different in width and direction providing shaded movement between neighbourhoods (Bourbia and Awbi, 2004).

The houses are arranged around a central courtyard covered by palms branches. They are constructed by using locally available materials particularly the desert rose, stones and plaster. The original traditional dwelling of Oued Souf is called Haouch and designated to house extended families. The house is surrounded by its external thick windowless walls and attached to three other houses in order to provide a minimum exposure to solar radiation. The walls are constructed making use of local materials such as 'gypse' which helps to ameliorate thermal discomfort in summer by absorbing the heat during the day and releasing it at night. Also, as sand does not store much heat due to the air between its particles. It cools down quickly after sunset and may even generate morning fog in desert conditions.

The thermal performance of 'isothermal' flat roofs can be improved by adding thick layers of earth. In the case when the roof is a dome (the area of a half sphere is three times that of a flat terrace), it will receive relatively much less solar radiation. Therefore, it warms more slowly than a flat terrace (Fezzai et al, 2012).

The traditional house of Oued Souf comprises a semi-public transitional space 'skiffa' which provides privacy for the courtyard from external strangers. The skiffa is often endowed by 'khamisa': a traditional way to protect the house from bad-eyes of other people. The doorstep/doorway signifies the separation between the indoors and outdoors. Also, the house includes a kitchen, a cellar or 'khabia' and a number of rooms 'ghorfa' or 'damsa'; if the ceiling has a form of a vault, the rooms will gradually grouped together in order to satisfy the increased needs of the households.

In the North and South parts of the house, two covered spaces called 'sabat' open onto the courtyard. The North Sabat permits a maximum exposition to solar radiations in winter while the South Sabat and an excavated underground area provide the protection from heat in hot seasons (Nabila, 2007).

### **2.3 Hoggar Dwelling**

The Touareg are the people who live in Hoggar; their origin is a mixture of Sudanese, Berber and Arabic. The Touareg are a group of tribes who live in the high mountains of Hoggar in the extreme south of the Algerian Sahara (Benmatti, 1982). The region of Hoggar is the highest land region in the Sahara where many summits exceed 2500m. Despite the southerly location, the region is relatively favoured in terms of climate, and in comparison to other parts of the desert it is less hot and experiences higher rainfall.

The Touareg live in tents or in small buildings called 'zeriba'. The tents are relatively primitive and consist of a wide leather velum envelope formed by assembling tanned goat or sheep skins painted in red and sewn together. This roof is supported by a tall wooden column in the centre and generally three other columns shorter than the first: one in the middle of the open side of the tent, the two others in the two extremities from that point. Despite its primitive form, the tent can be closed at night almost completely which can protect the inhabitants from the cold nights of winter. One half of the tent is reserved for male use (storage of clothes, saddle and weapons); the other part is occupied by the woman (clothes, personal items, and kitchenware); however the two parts of the tent are not separated by any physical barrier (Demoulin, 1928).

The Zeriba is a small hut representing an intermediate stage between the nomads' tent and more modern forms of house. It is made of stones and covered by palm leaves. The zeriba has generally a cubic form approximately 2.5 m square in plan but sometimes with a conical roof (Pandolfi, 1994).

### **2.4 Traditional Courtyard Houses**

Courtyard housing is a universal type of habitat and it is not unique to the Arab world or to Algeria. It is widespread in diverse regions in different geographical locations, climates, societies and cultures: several civilisations have used it as the main design component of housing such as the Assyrians, Persians, Greeks, Romans, Byzantines and more recently found in Islamic architecture. However,

although courtyard housing was a key feature of traditional design in many parts of the world, there are significant differences of function and importance relating to the function of the interior courtyard in the Islamic region.

The importance of courtyards has increased under the influence of the Islamic religion and subsequently Arabic architecture took this to form a specific room/space characteristic in plan, in form and in decoration. In this, the courtyard became one of the main architectural features of Arabic houses and gave opportunity to develop a variety of associated features: loggias, galleries, high level openings, oriels and elaborate sun-shade ornamentation (Edwards et al, 2004).

The study will focus on the medina of Constantine as one of the oldest medinas in Algeria and in which fine examples of traditional forms of Courtyard Houses are to be found.

### 3. THE MEDINA OF CONSTANTINE

Constantine is one of the oldest cities of Algeria which dates from 3000 BC. It is situated in the centre of the North East of the country. The city was a base of the Phoenicians, Romans, Vandals, Arabs, Ottomans and finally the French. The medina of Constantine is classified as of national heritage significance. The urban fabric of the medina is extremely dense and the network of streets and routes in the medina follows directly the morphology of the site. Unlike the streets and boulevards of occidental countries, the layout of roads has an organic plan and has no regular geometric form.

An analysis of the plan of the medina shows that the urban fabric has two different urban forms: a central area of souks (markets) which is exclusively related to commerce and culture; and a private residential area. The division of these areas is explained by the principle of separation between public (commercial) and private (residential) zones.

The traditional quarter of Souika is situated in the South East of the Medina. It still retains the major part of its original urban structure. The plan of Souika is composed of a homogenous irregular urban fabric. The residential clusters form small neighbourhood units within which basic neighbourhood facilities were provided such as a bakery, public baths, mosque and a school. The clusters are formed by a maze of roads with a spatial hierarchy from winding alleyways ending by cul-de-sac which maintain the public/private relationship and separation.

Streets in residential areas are either partially covered by cantilevered volumes *sabat* or totally by additional living spaces. Overall the hierarchy of streets is as follows:

1. A commercial axis as a public street.
2. Secondary roads as semi-public streets.
3. Alleyways and small streets/cul-de-sacs as private roads.

The difference between the main commercial axis and the private cul-de-sacs is one of the important characteristics of the residential urban fabric of the Arab-Islamic medina. This variation allows the separation between the private domain of housing and the public areas in order to provide privacy of houses on the urban scale. See figure 1 for an image of a typical house in Constantine.



**Figure 1** Traditional house in the City of Constantine, Algeria

#### 4. SPATIAL ORGANISATION OF THE COURTYARD HOUSE

Traditional houses in the medina of Constantine have a simple irregular geometric form consisting of two or three-storey structures surrounded by external windowless walls and organised around the courtyard. The houses are in most cases provided with pitched roofs inclined to the patio/courtyard area. The plans of the houses are generally similar in their basic characteristics but may vary in detail, and spatial organisation and the hierarchy of spaces in the houses are very similar.

Courtyard houses of Constantine are generally found in three forms:

- Houses with columns and arches which indicate occupancy by more affluent families.
- House with large pillars, columns and lintels, which represent the more generally found dwellings occupied by intermediate households.
- The third form is similar to the second but is differentiated by the elevation of its patio from the floor to allow the use of the ground floor as a store area. This type of house is generally located in more commercial street areas.

Generally however there is no social or spatial segregation between poor and rich families and both live side by side with each other, the only signs of difference being the height of the house and the decoration of the external doors. In all cases the courtyard receives and distributes sunlight and fresh air to the other parts of the house.

The courtyard also serves as the focus for the preparation of food, and as a laundry, children's play and outdoor living space. It also acts as a circulation space surrounded by alleyways and arched galleries which are designed to avoid any direct visual intrusion (from the semi public spaces into the private central space of the house). Further it provides a covered transitional space between the rooms and the open part of the court.

The courtyards of vernacular dwellings in Constantine have a regular form: square or rectangular. Their length is varies between 8-10m, whilst their depth is between 2-3m, possibly because of the limit of available cross-beam length.



**Figure 2** Typical layout of a courtyard house in the City of Constantine, Algeria (ground floor left, first floor right) Key: 1 = Public (Bit, skiffa); 2 = Semi public (Services); 3 = Private (Female and family living, or bedroom); 4 = Open space (Courtyard); 5 = Transitional spaces (Riwak).

The rooms generally located at its two extremities are elevated doukana (storage places). The central area of the room (Kbu) is opposite to the door and is balanced by two lateral sitting bay areas. The house is accessed through the skiffa, a small angled space which connects the public (exterior), semi-public and private spaces of the house (Barkat, 2006). The skiffa is also the reception area for visitors, particularly men who are not allowed to enter into the house. This place is connected directly to a reception room which is the most decorated room in the house and designated to receive male guests. Figure 2 shows the generalised form of the courtyard house set on two storeys.

#### 5. THE PROVINCE AND CITY OF JIJEL

The Province of Jijel is located in the north east of Algeria and until 1974 it was a sub-prefecture of

the Province of Constantine. It is bordered by the Mediterranean Sea to the North with a coastline of 120 kilometres, and the Provinces of Skikda in the East, Bejaia in the West, and of Setif and Mila in the South. It is divided into 28 communes and 18 sub-prefectures (Dairas) and has a total area of approximately 2400 km<sup>2</sup> of which 82% is mountains; it has an estimated population of 650,000, most of whom live in the North part of the Province. The actual City of Jijel has an estimated population of 134,000 inhabitants and occupies just 62 km<sup>2</sup> (2.6%) of the land area of the province, and this results on a high density of population of 2,140/km<sup>2</sup> (when the average density is just 264 persons/km<sup>2</sup> (Wilaya de Jijel, 2013).

Due to its strategic location, Jijel has been an attractive destination for colonists since the pre-Roman times. The city was prosperous in Phoenician, Carthaginian, Roman, Byzantine, and Arabic times. Following a large earthquake in 1856, the reconstruction of the city took place under the French occupation resulting in a new city designed by Scheslat in 1861. The city was built in an orthogonal plan focused around the military garrison 'the citadel'. The plan was similar to European cities with a triangular form constrained by the terrain form and also by the layout of ramparts, the rules of fortification, and the location of the gates into the city. According to the principles of Haussmann's urbanism, this plan included the key elements of urban fabric: the regularity of pathways, the alignment of the road structure, and the important role of public areas and squares.

The distribution of the population showed a concentration of colonists in the North part of the triangle, close to the citadel, the Sea and around the already existing facilities. The native population was grouped in the South West part of the city and occupied a very dense area with very tight access from narrow streets. In 1885, the port was rebuilt and later the Eastern area became an expansion area for the colonists who built housing developments with beautiful villas facing the beach. On the local Arab side, informal settlements spread parallel and outside the triangle and created two new quarters: la Pепенiere and the Faubourg (Safrai, 2008).

After Algerian independence, Jijel witnessed an increase in population arising from a rural exodus towards the city. However, no spatial expansion was planned and little organized construction took place. This resulted in the densification of indigenous quarters and the appearance of other new spontaneous quarters: village Mustapha, la Crete, etc.

From 1974, with the nomination of Jijel to the status of provincial town and the implementation of a special development programme, there has been a considerable rise of population (the population has multiplied by 3 times in a period of 20 years, from between 1977 and 1998).

## **6. HOUSING POLICY AND HOUSING DEVELOPMENT IN JIJEL**

Since the 1970s there has been a very sharp increase in demand for housing, particularly social housing. In this period the city initially grew haphazardly by juxtaposition of urban entities in particular informal housing. The urbanisation of the city occurred rapidly and without much detailed forward thinking on urban development in both medium and longer terms. This has impacted on the fragile balance between the urban system inherited from the colonial period and created morphological and functional failures that make urban management rather complex (Safrai, 2008).

From 1985, the increasing housing crisis and the emergence of informal settlements lead to the launch of a major public housing program and the creation of three new zones of urban habitat 'Zone d'Habitat Urbaine Nouvelle', each of which have been designed to accommodate 50,000 inhabitants (Hallal, 2007). These Zones were well intentioned; however their implementation has been less satisfactory because of the emergence of informal settlements. This situation was aggravated particularly in the period between 1990-2000 due to the civil war, the resulting insecurity, and the degradation of living conditions in rural villages and mountains. Urban and architectural decisions in Algeria and particularly in Jijel have sometimes been made according to political and personal evaluations which are sometimes more powerful than urban planning instruments, and this can have significant adverse impacts.

One of the key design features which is seen in the high density development to meet urgent social needs in Jijel has been the lack of development with regard to traditional design. This has led to multi-storey apartment blocks which have forms of outdoor-indoor spaces – balconies etc, but without the attributes understood and liked by the indigenous population, see for example Figure 3.



**Figure 3:** Example of ‘closed’ balconies

## 7. SURVEY OF BUILDING PROFESSIONALS

The research project, of which this paper reports a part, is involved in integrating the views of stakeholders into the design and construction process in a much more influential way. However in order to do this, existing knowledge and attitudes must be known. A number of detailed interviews have been carried out with stakeholders, and the results of the first phase of these, with an influential group of architects and other professionals is reported here.

The study was carried out with twenty-one architects and engineers working in either private bureau or public administrations. The aim of this questionnaire was to assess the knowledge of architects in Algeria in terms of sustainability which can affect the quality of design and the sustainability of the built environment. It also sought views and understanding on differences between traditional and modern design of dwellings.

- On the question concerning sustainable development objectives: 16 professionals answered that they have an idea of the objectives and on what makes a building sustainable; however, only 3 out of 21 gave a suitably detailed definition and the others just related the subject to energy consumption. In addition, 17 out of 21 think that the Algerian Government is not making sufficient effort to raise awareness amongst public and professionals on the topic of sustainability.
- In relation to comparisons between modern apartments and traditional courtyard houses in terms of sustainability, 14 respondents out of 21 preferred the traditional house and they argued that the traditional design respected the lifestyle of local inhabitants. Also, they stated that the courtyard provides more natural light and better ventilation to the dwelling.
- A majority of interviewees (14 out of 21) also agreed that traditional architecture satisfied the needs of the local population in terms of space, while only 7 out of 21 thought that modern design and construction met the needs of the inhabitants. 13 out of 21 interviewees claimed that traditional design met the needs of local population in terms of comfort. However, only 4 out 21 agreed that traditional design respected urban level regulations in Algeria. Some of the interviewees think that is because the regulations were only devised some time after traditional design had evolved.
- All the interviewees agreed that it was important to consider the opinion of future inhabitants in the design of new houses.
- It was clear that the majority of professionals do not have sufficient understanding of the subject of sustainable development which affects the quality of the built environment.
- The vast majority (20 out of 21) of the architects interviewed thought that the quality and impact of urbanism and the built environment in Algeria is poor and lacks respect of regulations.

- Some of the interviewees suggested that the design of future housing projects should fulfill the 'real needs' of households. They also believed that future design should consider the climatic and environmental factors of the region. Moreover, they thought that the Algerian government should improve the quality of construction in terms of space, comfort and aesthetics.

## 8. CONCLUSIONS

Vernacular houses in Algeria have varied according to different climatic and geographical regions. Houses design, the use of local building materials and construction system were adopted for each region separately in order to cope with different environmental factors and resource availability. Thus each type fulfilled social needs and society values and traditions in different ways.

However, it is not possible simply to use the systems and practices from previous generations but there is need to study and learn from their experiences and the sustainable systems they introduced (Eiraji and Nambar, 2011) but also to adapt. Human behaviour and culture should also be considered in modern housing design (Vaziritabar, 1990) and future cities should be created by learning from historic and traditional cities: conserving cultural heritage and promoting sustainable development in order to suit contemporary needs.

Urban policies which lead to new housing development need to take into account the older traditional forms but in new ways such as to introduce new forms that can replace the older courtyard form seen so successfully used in Constantine. New housing must also be sustainable and therefore new policies and actions must be informed by current stakeholder views but also seek to address and modify those stakeholders' opinions. The results of the interviews indicate areas which require attention and can be developed for more sophisticated analysis. This research ultimately aims to combine sustainability potential in traditional architecture with modern technologies and occupant needs to create new sustainable cities that suit present and future needs of the inhabitants.

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# PLEA 2017 EDINBURGH

*Design to Thrive*

## **Analysis of sustainable collective housing in Jijel, Algeria: evaluation of resident satisfaction.**

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**Abstract:** Worldwide, 40-percent of all energy used is consumed in the buildings sector. In this context, most developed countries have orientated their research and design to encourage energy efficient or green buildings; however comparable sustainable architecture is still in its early stages of exploitation in many developing countries. There are many pressures that can reduce emphasis on sustainable design in developing countries; for instance over one billion people worldwide still lack adequate shelter and suffer poverty, and Algeria is one example facing a pressing housing shortage. The socialist government that came to power after Algerian independence in 1962, considered this problem to be the major issue and this resulted in the initiation of major building programmes for social multi-storey housing estates. This research described in this paper reports on the quantitative and qualitative analysis of collective contemporary houses built in the city of Jijel. Detailed questionnaires were used with 30 residents in Jijel. The results showed that residents were more concerned with space issues while thermal comfort was neglected. Another interesting finding was that most of the interviewed residents would prefer to participate in the design of their houses; a process that would enable them to improve space and thermal comfort.

**Keywords:** Green buildings, sustainable dwellings, housing shortage, Algeria.

### **Introduction.**

In addition to enhancing human life and comfort, urbanisation and industrialisation have serious negative impacts on the environment. Global warming, industrial waste, and air pollution adversely affect the ecological balance (Memon, 2008). The most common definition of sustainability is 'meeting the needs of the present without compromising the ability of future generations to meet their own needs'. This definition was first used in 1987 in the Brundtland report entitled "Our Common Future" published by the United Nations World Commission on Environment and Development (WECD, 1987).

Worldwide, 40-percent of all energy used by humans is consumed in buildings sector. The increasing need to make buildings more energy-efficient can be explained by the limits of natural resources, national security, environmental concerns, climate change, social justice, and rising costs (Ramsdell et al.). In this context, most developed countries were oriented to research and design of 'energy efficient' or 'green' buildings since the energy crisis of 1970 (Zhu and Lin, 2004). However, there are many pressures that can reduce emphasis on sustainable design in developing countries; for instance over one billion people worldwide still lack adequate shelter and suffer from poverty (United Nation, 2012). Algeria

is one example of a developing country facing a pressing housing shortage. The problem threatens cities with the spread of informal settlements and slums around all Algerian cities. The main causes of this dilemma were the acute rural exoduses to cities which took place in two different periods. The first was after independence in 1962 when people grouped in urban areas in order to ameliorate their living conditions (Benmatti, 1982). The second was during the Algerian civil war between 1990 and 2000 when people escaped from rural areas to live in more secure urban areas. However, not all new informal settlements are created by rural migrants as there has also been population growth. Consequently, Algeria witnessed a large spread of multi-storey housing after independence in 1962 (Daara, 2009).

### **Housing policy in Algeria.**

The new national housing policy adopted by the Algerian government since the five year plan of (2000-2004) aimed to improve living conditions for all social groups with special emphasis on low income groups in order to achieve better space occupancy and slow down rural exodus. This policy was based on diversifying housing types according to households' incomes (MHUV, 2012). Consequently, new housing types were established in order to meet the needs of intermediate income households who were not allowed to benefit from the social rental houses designated to low income families and could not afford to buy the expensive promotional (luxurious) houses. However, this policy failed to respond to the real demand of residents. Table 1 shows the ratio of demand and offer for different housing programmes in the province of Jijel. It indicates that there is a deficiency in housing offer in comparison with the number of demands, the number of demands is more or near double the cumulated programmes excluding Promotional public houses (LPP).

Table 1: *The demand and offer of collective housing programs in Jijel until 31/12/2016. (Source: Based on data from Housing department, Jijel).*

Housing Programme	Cumulate (Offer)	Demand Number	Ratio Demand/Offer
Social Rented (LPL)	16981	40972	2.41
Promotional assisted (LPA )	6727	14700	2.18
Rent to sell (LV)	3600	7074	1.96
Public Promotional (LPP)	1000	426	0.42
Total	28308	63172	2.23

In fact, citizens are unable to benefit from government assisted houses due to households' low incomes and sometimes unemployment. Also, there is a big gap between salaries and housing prices. The ratio between the price of a house and the average annual income of a middle-income family is 9, which means that the family has to save her annual income for 9 years to be able to afford an LPA house (Bellal, 2009).

### **Survey for the evaluation of residents' satisfaction.**

Collective housing dominated the urban fabric of the city of Jijel without any consideration to the aspects of sustainability such as comfort, climate adaptation, the use of construction materials, and the respect of social and cultural values of the Algerian society. In fact, occupants' needs must be combined with modern technologies and sustainability potential in traditional architecture in order to create new sustainable cities that suit present and

future expectations of the inhabitants (Mehibel et al., 2014). Consequently, the research project, of which this paper reports a part, is involved in assessing potential residents' satisfaction and integrating their views process. This research included quantitative and qualitative analysis for collective contemporary houses in Jijel using comparative analysis through descriptive, qualitative and spatial analysis for the case studies. Therefore, a number of detailed interviews have been carried out with thirty residents from three different collective housing estates in the city of Jijel, and the results are reported here.

The qualitative survey is divided into four different parts: Exterior environment, spatial comfort, thermal comfort and housing preferences. Each part contains a number of closed ended questions and open ended questions in order to evaluate the inhabitants' satisfaction of the design of their dwellings. The three case studies are governmental housing estates which are: Site 1 is the 400 social houses estate (400 LS) this kind of houses is entirely financed by the government; it is designated to low income households living in very bad conditions or those who don't own a suitable house. Site 2 is the 170 social participatory houses estate (170 LSP); this type of houses is designated to households with intermediate income who are eligible to a governmental non- refundable financial aid. Site 3 is the 375 promotional (Luxurious) houses estate (375 LP); this kind of houses is intended to comfortable households or individuals who are not eligible for any type of governmental financial aid.

***Exterior environment.***

When the residents of the three estates were asked for the perception on the presence of green spaces, children playgrounds and squares for inhabitants where they can be gathered; most of the inhabitants considered that there is very little. Some inhabitants of the ground floors enclosed the surrounded areas adjacent to their blocks and planted them which created some sort of private external green spaces (Figure 1). In fact, this act is not permitted by the local municipality as such places should be public and shared between all residents. Also, the majority of respondents in the three estates claimed that there are no play areas and the children are playing in car parks and undesigned areas between blocks (Figure 2).

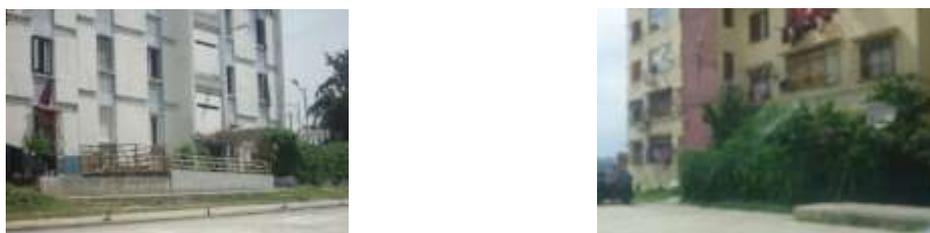


Figure 1: Public areas enclosed by residents of ground floor to make private green spaces in: a) 400 LS site and b) 375 LP site.



Figure 2: General and street views: a) 170 LSP and .b) 400 LS site.

Figure 3 shows children's playgrounds in the 375 LP estate which are in a poor state, this problem can be seen in many other collective housing estates in the city of Jijel. Residents can be blamed for such behaviour and the government should take action for the destruction of public places.



Figure 3: Destroyed children playgrounds in the 375 LP estate.

The majority of respondents considered that there are no squares or areas where residents and neighbours can gather. When asked if they preferred having such areas, most residents agreed; only 20% in the 400 LS and the 375 LP estates disagreed; they were women who for cultural reasons preferred not to have such areas close to their houses in order to have more privacy in using the balconies.

### ***Spatial comfort.***

#### *Housing organisation preferences.*

All the apartments are organised around a corridor. However, The vast majority of respondents in the three estates (80% in 170 LSP and 70% in both 400 LS and 375 LP estates) preferred to have the dwelling organised around a central space rather than a corridor. They justified their answers that this organisation provided more space, better air circulation and more accessibility to the other parts of the house.

#### *Size of the house.*

In the two social estates (170 LSP estate and 400 LS estate), the majority of respondents (70%) found the size of their apartments too small for their family needs, and all of them preferred to have one or two extra rooms to be used as a room for children and a dining room. Interestingly, 60% of respondents in the third estate (375 LSP) considered that the apartments are of the right size for their family needs 20% of them stated that the apartment is big and only 20% considered their apartment small. Just 20% of the respondents desire to have an extra room to receive guests. Table 2 represents the total living area of houses in the three estates. It is obvious that total living areas of the promotional flats is similar to social houses. However; residents in the promotional estate are more satisfied with the size of their houses.

Table 2: Area of the houses.

Estates	Living area (m <sup>2</sup> )			
	F3 (Living + 2 bedrooms)		F4 (Living + 3 bedrooms)	F5 (Living + 4 bedrooms)
170 LSP	70,39	68,45	69,99	-
400 LS	65,21		76,68	88.15
375 LP	68,66		80,95	93,40

### *Size of the different rooms.*

The majority of respondents from 170 LSP and 400 LS estates find the size of the living room and the other bedrooms small and all of them find the shape inconvenient to accommodating the furniture. In some cases they had to swap between the bedrooms and the living room in order to get more space area for children room or to get more space by rearranging the furniture in parents' room.

Conversely, in the 375 LP estates, the majority of respondents stated that the bedrooms have the right size and they can arrange the furniture the way they want. Also, just half of respondents find the size of the living room small and the other half find it about the right size. However, 70% of respondents find the shape inconvenient to arrange the furniture. Table 3 shows the area of the living room in the estate of 375 LP (16.99m<sup>2</sup>) which is very small for a promotional house and even smaller than the area fixed by the Algerian regulations for social rented housing which is 18 m<sup>2</sup>. That explains the fact that most residents close the loggias in order to gain more living area in the living room.

Table 3: Area of the living rooms.

Estates	Living area (m <sup>2</sup> )		
	F3 (Living + 2 bedrooms)	F4 (Living + 3 bedrooms)	F5 (Living + 4 bedrooms)
170 LSP	19.66	-	-
400 LS	14.96	14.96	14.96
375 LP	16.99	16.99	16.99

Residents of the three estates were asked if there are any other activities they cannot do in their houses because there is not enough space. In 170 LSP estate, the number is more significant than the other estates (70 % in 170 LSP versus 40% in 400 LS and 375 LP estate) which mean that residents in 400 LS and 375 LP estates are more satisfied in terms of space and this can be related to the number of bedrooms. Some respondents answer that they cannot practice sport, or have family gatherings during social and religious occasions or receive guests. Table 4 shows that the areas of bedrooms in the three estates are very close even with the promotional apartments. However, people in this site are more satisfied in terms of spatial comfort as they have more number of bedrooms. So it can be concluded that residents do not need bigger areas of bedrooms but they want a larger number of bedrooms.

Table 4: Area of the bedrooms.

Estates	Living area (m <sup>2</sup> )			
	Bedroom 1	Bedroom 2	Bedroom 3	Bedroom 4
170 LSP	12.31	12.74	-	-
400 LS	12.25	13.30	11.47	11.47
375 LP	11.02	13.34	13.80	12.45

### *Size of the kitchen.*

The vast majority of respondents in the three estates find the size of the kitchen small and they don't have enough space for work and to arrange different equipment. In some cases, residents in the three estates have to use bedrooms, corridor, bathroom and balconies in

order to put the rest of their electrical equipment. Table 5 shows the area of the kitchen in the three case studies, it also shows that the kitchen in the 400 LS estate is smaller than the other sites.

Table 5: Area of the Kitchen.

Estates	Area of kitchen (sqm)		
	F3	F4	F5
170 LSP	10.41	-	-
400 LS	07.56	07.56	07.56
375 LP	08.29	08.29	08.29

*Importance and use of the kitchen's loggia.*

The majority of apartments in the three estates have a loggia connected to kitchen. The loggias are used as an arrangement space, a place to dry clothes, put water tank, washing machine, the fridge and tabouna which is a cooker for traditional bread; some of them have been closed in order to gain more space to the kitchen (Figure 4), which shows one of the inconvenient consequences of closed loggia; the resident had to use the corridor to dry the clothes in rainy days (Figure 5).



Figure 5: Closed loggia in 400 LS estate.



Figure 4: Drying the clothes in the corridor in a rainy day(closed loggia in the 400LS estate).

***Thermal comfort.***

In this section residents were asked of their feeling of comfort in both summer and winter periods.

*Summer comfort.*

More than half respondents in the three estates answer that they feel comfortable in their houses in summer. However, in 400 LS and 375 LP estates mainly all respondents are using air conditioners which opposite their feeling of comfort. On the other hand, just 10% of respondents in 170 LSP estate are using air conditioners which make their feeling of comfort more correct.

*Winter comfort.*

In 170 LSP estate, all the interviewees don't feel comfortable in winter due to cold and the lack of natural gas to use heaters. Contrary to the other two sites where nearly all respondents stated that they feel comfortable in their houses during winter but all of them are using heaters.

*Energy consumption.*

The results found in thermal comfort analysis help explain the energy consumption:

- The consumption of electricity in the 400 LS and 375 LP estates is approximately doubled in summer in comparison to winter as they all use air conditioners. However, the consumption of gas is much higher in winter than in summer as they all use heaters.
- In the 170 LSP estate, the price of electricity is similar between summer and winter as the majority of them don't have air conditioners.

### ***Housing preferences.***

When residents were asked about their housing preferences:

- The majority of respondents wanted to change the house to an individual villa with a garden.
- More than half respondents wanted to participate in the design of their houses.
- In the three estates residents suggested to build cities with small number of houses, bigger apartments with green areas and children playgrounds.

### ***Results.***

- The only different criteria between the studied social and promotional estates is spatial comfort; as people in the promotional estate are more satisfied in terms of space than the others; however, people want extra rooms to gain more comfort.
- Thermal comfort is not considered in the design of houses. However, residents were not concerned about it as they can afford their comfort with energy consuming appliances.
- Although, people are satisfied by their apartments in the example of the promotional estate, they prefer to have an individual villa with a court or a garden; and most of the interviewed residents prefer to participate in the design of their houses.

### **Conclusion.**

Housing policy in Algeria fails to respond to residents needs in both quantitative and qualitative levels. In fact, many problems are facing the housing sector and the most important issue is the serious imbalance between housing demand and the available supply. Unfortunately, a significant increase in the number of houses being produced is not possible, particularly after the economic crisis declared in the country in 2015 caused by the sharp decrease of oil prices. Also, the slowness of administrative procedures in most cases is one of the important causes that delay the completion and then the delivery of new projects.

In order to reduce the cost of projects the government can:

- Make better use of local workers, developers and professionals rather than importing them from overseas, an example of Rent to sell houses projects in Jijel; a total of 2000 houses are under construction by an international company using more than 200 foreign workers. The government could train local workers and professionals and this will reduce the rate of unemployment and also reduce the cost of houses.
- Integrate and encourage sustainable behaviours such as the use of recycled materials and renewable energies which can reduce energy consumption in different phases of housing projects.

- Integrate the new technologies and techniques in all fields of work in order to speed the administrative procedures in all stages of projects: Choice of land plot, design, and construction in order to deliver the houses in their deadlines.

In terms of qualitative issues; certainly it is not always possible to satisfy all people's needs but the government can find a method of work to integrate civic society in the process of design such as by surveys to assess the needs and preferences of future inhabitants.

- In terms of design; the exterior environment should be provided with green spaces, secure children playgrounds and squares for residents to be gathered, also, the state should penalise and strictly prohibit any behaviour that damages the exterior environment.
- The design of houses should consider bioclimatic parameters in order to build passive, low energy consuming buildings.
- The form of social LPL and LPA houses has been fixed by the government to a three-room apartment (living+ 2 bedrooms) with a little increase in the living area of the house from 68 m<sup>2</sup> to 70 m<sup>2</sup> ± 3%; this initiative aimed to avoid the increase in assisted houses prices. However, the number of rooms is not proportional with the average rate of housing occupancy which is 5.33 in the province of Jijel; this has resulted in most cases in the use of living rooms as bedrooms in order to permit male and female segregation. Consequently, it is important to research the optimum configuration of design that permits ways to increase the number of rooms within the same living area.

Therefore, unless lessons from failure of previous policies are learned and new effective measures to combat the above problems are taken by the government, the housing policy in Algeria is likely to fail again in ensuring adequate housing for its citizens and obtaining any level of urban sustainability.

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